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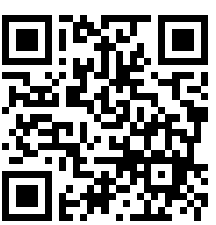

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(From a photograph by F. E. Mackay.)

CARLISLE-EDINBURGH EXPRESS : NORTH BRITISH RAILWAY.

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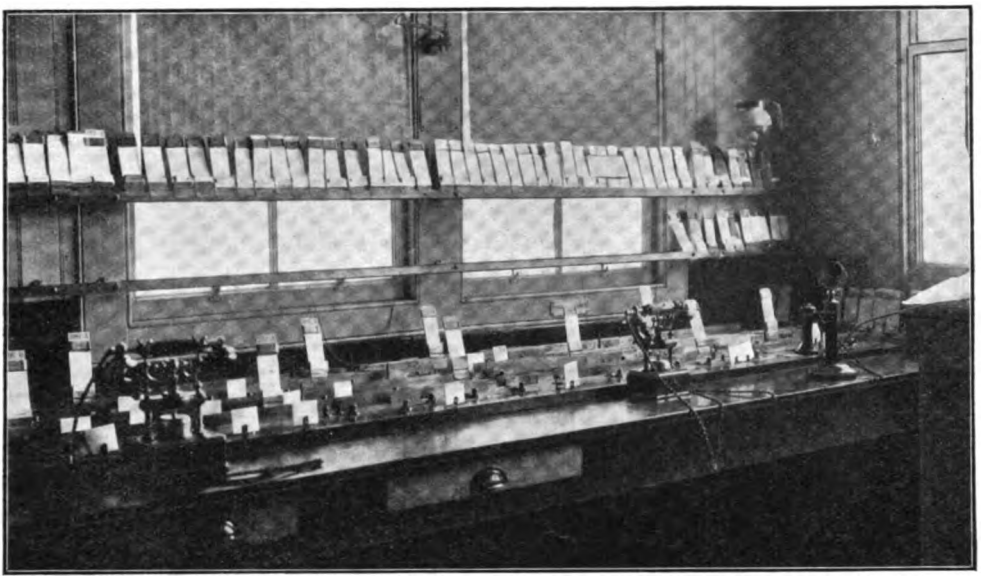

THE TRAIN CONTROL ROOM AT PORTOBELLO: NORTH BRITISH RAILWAY.

The "Control" System on the North British Railway.

By TOM MOFFAT.

THE North British Railway has the distinction of being the first company North of the Tweed to adopt the train control system. The initial installation covers the Lothian district, and is confined to goods and mineral traffic, affecting about 50 miles of double line and 40 miles of single track. This area includes the coalfields lying to the south and east of Edinburgh, as well as the Ports of Leith and Granton at which the great bulk of the shipment traffic is dealt with.

The control office is situated at Portobello, on the north side of the marshalling yard, which is the largest in Scotland. There are four divisions: the control master's office, clerk's room, telephone and telegraph room, and the control room. On one side of the control room the "Control" board is fixed. This consists of a table about 18 ft. in length by 3 ft. 6 in. in breadth on which bright steel bands fixed on edge represent all running lines, both double and single, within the control area. Screwed to the board at intervals are small brass plates marking the positions of the various yards, stations, signal boxes, collieries, works, etc., and close to these are placed name-plate receptacles in which are inserted cardboard tickets bearing the controllers' pencilled notes of the various wagons—loaded and empty—waiting to be dealt with.

Brass carriers about 5 in. in length by 2 in. in breadth, in which are inserted all needful particulars, are used to represent the "control" trains, and these are made in such a way that they can be readily clipped on to and moved along the steel bands or rails. A special rack, labelled "Engines in sheds," is provided above the control board for the reception of carriers bearing the numbers of engines which are in the sheds. There are two locomotive depôts within the control area. An average of 50 locomotives work entirely within the "control," while about 20 operate partly within and partly without the area. Each of these locomotives has its number painted on the side of the tender in figures bold and distinct enough to enable them to be easily distinguished by signalmen and others who report control train movements to the control room. By these numbers the control trains are identified, and as soon as an engine is booked out, the carrier bearing its number is placed in a rack labelled "Engines given orders." On the control room receiving advice of its departure from the shed, the carrier, which also bears an alphabetical letter denoting the class of the engine, is placed on the rail corresponding to that on which the engine

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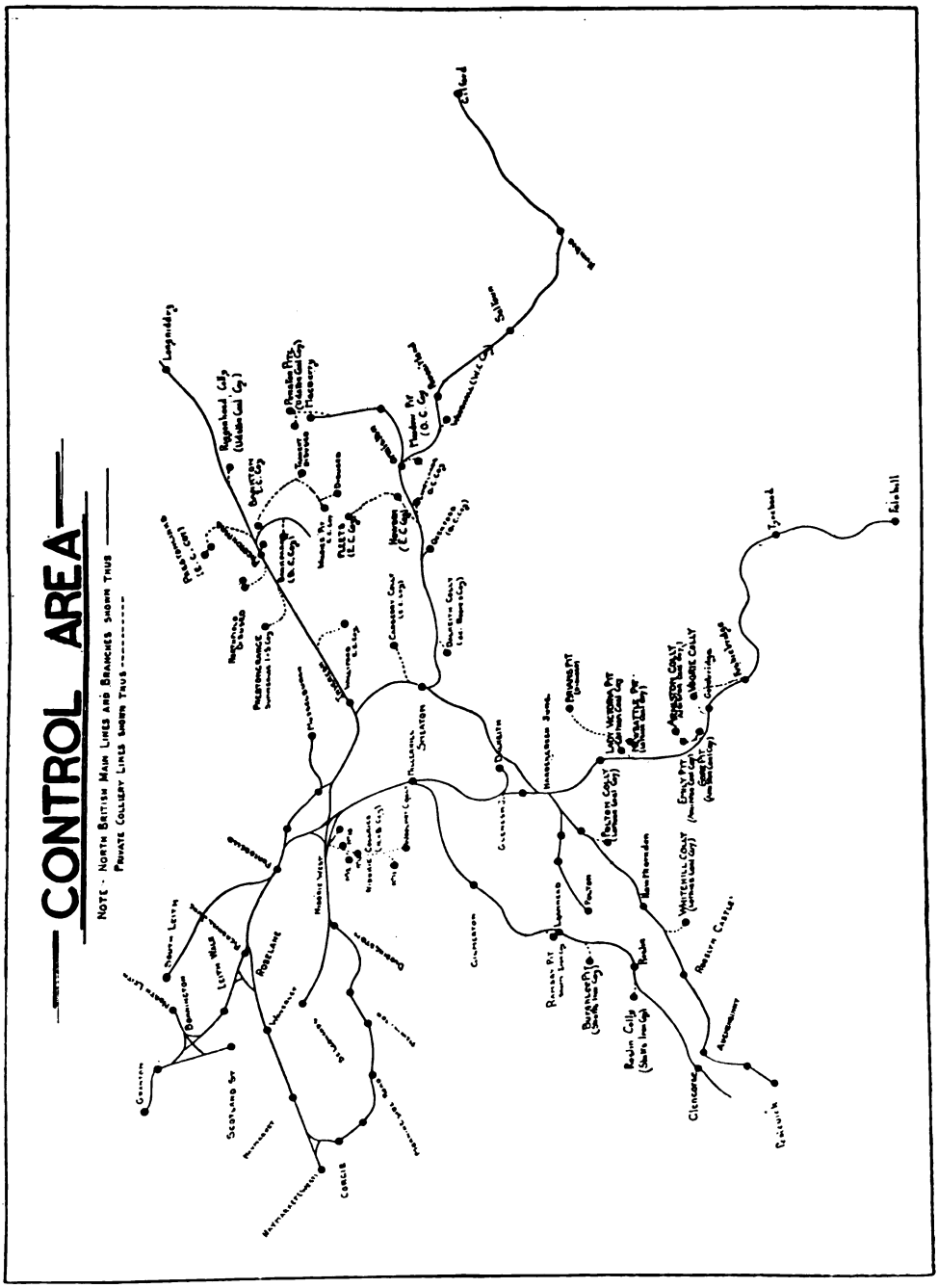

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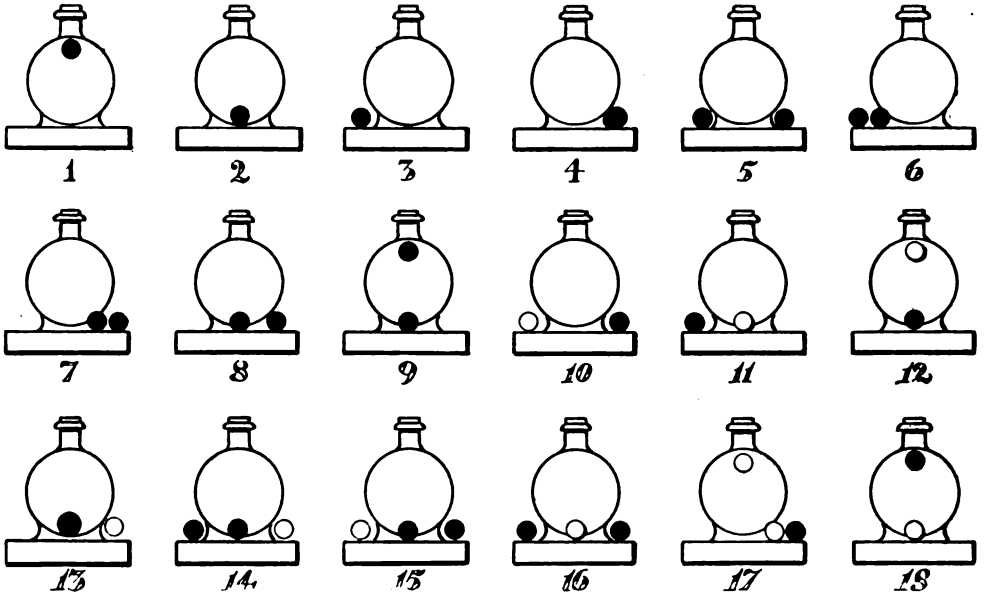
is running. The carrier is then moved from point to point along the rails in keeping with the reported movements of the engine, until the latter returns to the sheds, when the carrier is again replaced on the rack from which it was first removed.

To provide for the reporting of control train movements to the control room, a very extensive system of telephone connections to all parts of the control area has been linked up to the telephone room, where, by means of a miniature exchange, through connections are promptly made with the telephone instruments fixed on the edge of the control board. In the control room there are two Post Office exchange telephones, as well as an instrument connected with the railway company's private exchange, through which direct communication can be had with the head offices in both Edinburgh and Glasgow, and with many of the important stations, yards, etc. There are fixed points for reporting to the control room the arrival and departure times, loads, etc., of "control" trains.

About 60 per cent. of the coal output of the district is shipment traffic, mostly dealt with at the Ports of Leith and Granton, some ten miles distant. In the case of all trains lifting shipment coal traffic, full

Distinctive Head Codes carried by Engines of Control Trains: North British Railway.



Note.—○ indicates a white light at night and unlit lamp by day.
● denotes a purple light at night and purple disc by day.

DESTINATIONS.

1 South Leith.
2 Granton.
Heriothill.
3 North Leith.
Leith Walk.
4 Portobello.
5 Musselburgh.
6 Smeaton.
7 Ormiston.
Macmerry.
Gifford Branch.
8 Morrisonshaven.
Wallyford.
Prestonpans.
9 Longniddry and points beyond.
10 Millerhill.
Glencorse Branch.
11 Hardengreen.
Lady Victoria.
Arniston.
Falahill.
12 Points beyond Falahill.
13 Polton.
Penicuik.
Hawthornden and beyond.
14 Niddrie West.
15 St. Leonards.
Suburban Stations.
Haymarket *viâ* Suburban.
16 Waverley.
Haymarket *viâ* Waverley.
17 Points beyond Haymarket West.
18 Engines of Control Trains running light from or to Sheds or otherwise must carry this Headmark.

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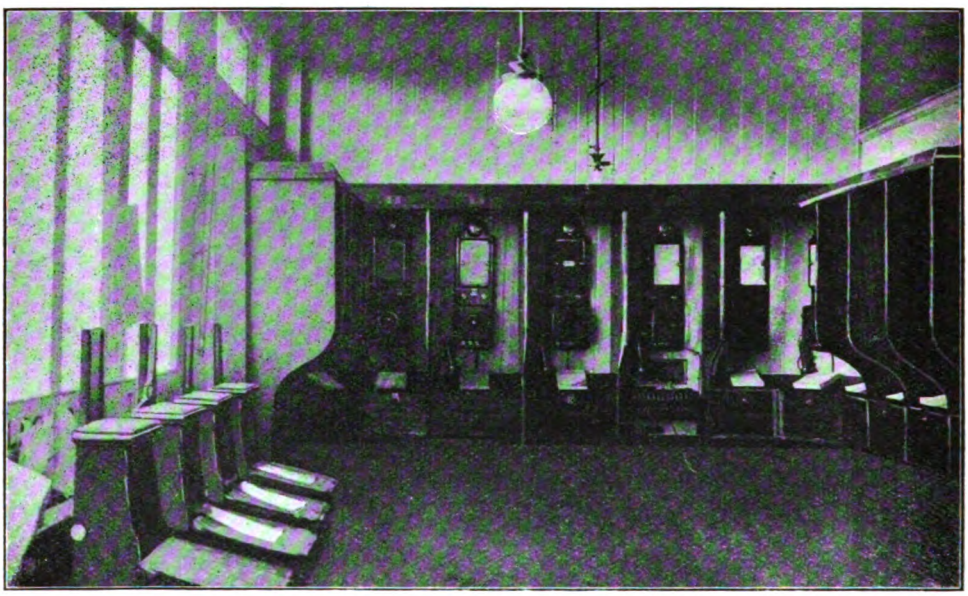
details of the wagons for each ship are advised to the control room from the collieries or yards in the vicinity, and particulars are also supplied from time to time of the opening of shipment coal and of ships loading or waiting loading berths. As regards trains leaving the ports or yards with empties for the collieries, particulars of the company's as well as of the various traders' wagons are supplied to the control office. By the information which he has always at hand the control master can at all times say exactly what traffic is lying at the various yards and collieries waiting a service, as well as tell the numbers of empty wagons which he has available at the various points.

assistant control master, three controllers, three control room clerks, five telephone and telegraph boys, and two general clerks. The controllers and telephone staff work in shifts of eight hours each.

The control master, in addition to having charge of the marshalling yard at Portobello, has also a supervisory charge over the yard working at Niddrie West and the yard and dock working at South Leith. The controllers, under the supervision of the control master, direct the use of all engines, guards and brake vans required for the working of goods and mineral trains, both booked and special, operating entirely within the control area, and they also have a partial control over the working of certain of the goods



THE TELEPHONE ROOM: CONTROL OFFICE, NORTH BRITISH RAILWAY.

To facilitate the identification by signalmen, yard staffs and others concerned of the control trains and their destinations, a series of distinctive engine head-discs and headlights, as shown on the previous page, has been adopted, and these are made use of also in the case of control engines or trains running light or empty from or to the sheds or depôts. By day purple discs with a white cross and unlighted lamps are used, and by night these are replaced by white and purple lights. The control office, which is open continuously from 10 p.m. on Sunday until 6 a.m. the following Sunday, is under the charge of a control master, with a staff consisting of an

trains which pass into or beyond the control area. The instructions to the staff state that the controllers are not expected to relieve signalmen of their responsibility of deciding the turn of the road to be given to any particular train, but they are free to make to the signalmen any suggestion in this direction they may think proper as occasion necessitates, and every endeavour must be made on the part of the signalmen to comply with such suggestions. Passenger trains, express goods trains, and long-distance goods trains, although passing through the area, do not come under the control.

The objects of the control are to move traffic from point to point as expeditiously

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and as economically as possible and with a minimum of engine power; to regulate the hours of the trainmen, and to arrange the supply of empty wagons. With the view of avoiding, as far as possible, light running, the controllers are consulted before engines are despatched from any of the yards with light loads or with a van only, or before lots of traffic are staged forward to any point, in order to see whether a better course may be found. The adoption of the control system in the Edinburgh area has enabled a number of inspectors to be withdrawn, and by the controllers taking over their duties and being in a position to give promptly full and accurate information regarding traffic working, as well as particulars of the available empty wagons, within their district, they are able to give traders a much better service than has hitherto been possible.

The collieries now deal direct with the control office in connection with their wagon requirements, and all requests for special trains or service within the control area are made to the control office instead of to the office of the District Traffic Superintendent as formerly.

The Lothian control system, which has been in full operation since August 17th, 1913, was really adopted by the North British Railway as an experiment, and as the most highly satisfactory results have been obtained from it since its inauguration, the company are very shortly to extend the system on a larger scale to more congested areas.

THE SIGNAL CABIN AT CRAIGENDORAN, NORTH BRITISH RAILWAY.

This cabin is interesting in that it serves both stations at Craigendoran, the North British on the lower level and the West Highland on the higher level. The neat architecture of the cabin is also worthy of remark.

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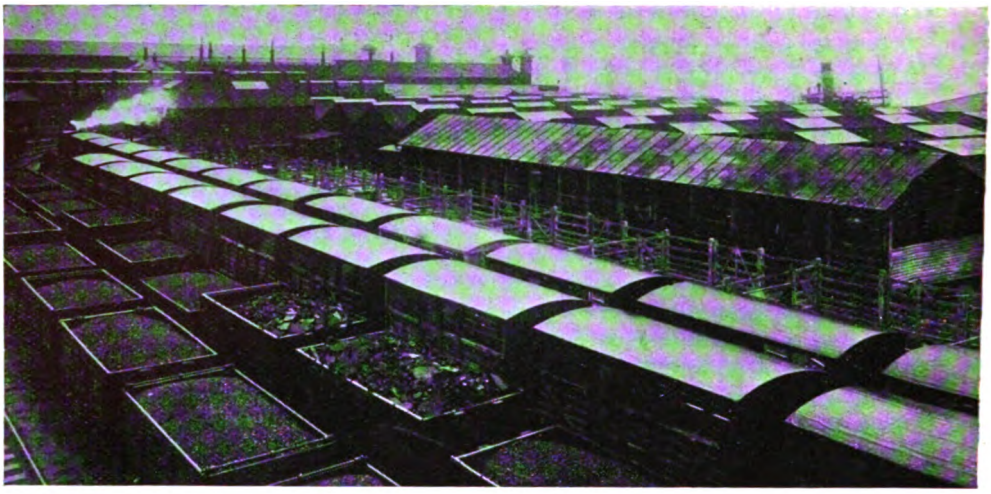

CATTLE LAIRAGE AT GREENOCK, PRINCE'S PIER.

Goods Traffic on the Glasgow and South Western Railway.

TERRITORIALLY most British railways are fairly correctly named: certainly the Glasgow and South Western Railway justifies its title, in that it serves just the area suggested by its designation—Glasgow and the south-western portion of Scotland, having, indeed, almost a monopoly of some districts, while in others it constitutes an important factor in meeting industrial and transportation requirements, passenger, goods and mineral.

The area served by the Glasgow and South Western Railway is exceptionally fortunate in its possession of the means which make modern industry possible. It has a rich source of power in the Ayrshire coalfields, the busy Clyde provides a magnificent means of access to the over-sea markets, and the service of an up-to-date railway company fulfils the requirements of internal transport. The broad and level valleys of the district and its sturdy population, considered in conjunction with its coal, its rivers and its railways, offer strong inducements to enterprising manufacturers prospecting for sites. It has not yet reached the full limit of its development. The volume of traffic carried over the Glasgow and South Western system is ever increasing, and the Company, as its history shows, has been and is ever alive to the possibilities of the district and ready to lend all the aid in its power to promote the growth of new industries and development of those already in existence.

The Glasgow and South Western Railway has its headquarters at Glasgow, and its lines radiate over the south west portion of Scotland, tapping many districts and serving the busy seaports on the Firth of Clyde. Its trains bring the produce of the world to ancient Strathclyde and carry away to the markets the many things for which the Glasgow area is famous.

It is interesting to note to what an extent the manufacturing part of the trade of a country—apart altogether from that portion which is necessarily located there—congregates round or near seaports. The desire to minimise cost of transport is, of course, the reason. This is particularly true of places on the Glasgow and South Western Railway. The principal manufacturing towns on its route—Glasgow, Paisley, Greenock, Johnstone, Kilmarnock, Ardrossan, Troon, Ayr and Girvan—are either actually on the sea-board or within easy distance by rail. This accessibility to the sea is a large element in the success of the Clyde district as a centre of industry.

A railway management, to be successful, must ever be alert and responsive to meet demands for new facilities: the Glasgow and South Western Railway has always

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had this reputation. It is not so big as some of its rivals. A reference to a map will show its comparative smallness, but whatever it may lack in this respect it more than makes up in the consequent economy and efficiency of administration, the decentralisation which is practised to such an extent by certain other companies being unnecessary.

The Glasgow and South Western route between Glasgow and other important towns on their system and shipping and industrial centres in England is much favoured by the trading public, as is shewn by the huge volume of traffic which is exchanged to and from the English Companies which terminate at Carlisle. To such an extent, indeed, is this the case that the great bulk of such urgent traffic as dead meat, fruits and vegetables, passes by the "South Western." Their chief Glasgow Goods Station, College, is very conveniently situated for dealing with these traffics, being within a stone's throw of the Fruit and Vegetable Market and a short distance of the Meat Market. College Station is, indeed, the nearest of the great termini to the markets mentioned. It is "hustling" exemplified to see the contents of a "meat" special being hurried out of College Station to the Meat Market in the early morning.

Ever abreast of the requirements of the times, the Glasgow and South Western Railway just recently erected a large building with all the facilities for ripening, sorting, and otherwise dealing with bananas. That fruit is an ever-increasing traffic. There are two varieties come into Glasgow —Canary Islands and West Indian—and frequently the traffic passes in train loads, steam-heated vans being employed during winter in order to maintain the desired temperature. An extensive Excise Bonded Warehouse is attached to College Station, and whiskies are blended and bottled in premises specially provided for the purpose. Many of the favourite "blends" are made up there and find their way thence to all parts of the country and abroad. College is the only railway station in the United Kingdom where the blending and bottling of whisky is carried on.

ENTRANCE TO COLLEGE GOODS STATION.

Whilst a few of the traffics dealt with at College Station have been mentioned, it may be said that the traffic of that place as a whole is of a very general character. The Company's heavy traffic in Glasgow is dealt with at their Eglinton Street Station, the lighter class being reserved for College, and when this is remembered a special significance attaches to the statement that the average daily sundry traffic passing through College amounts to over one thousand tons.

Other towns along the route of the Glasgow and South Western Railway have their own

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TRAIN OF REFRIGERATOR VANS FOR BANANA TRAFFIC ARRIVING AT COLLEGE GOODS STATION.

distinctive manufactures. Greenock is noted for its sugar refineries and shipyards, Paisley and Johnstone for their thread mills and engineering shops. Kilmarnock has also large engineering works, and in these days of pictorial advertising it may be known to many of our readers as the home of "Johnnie Walker." Kilmarnock, as well as Darvel, Newmilns, Galston and Dumfries, are largely interested in the textile trade. Irvine has large chemical works, and a world-known shipbuilding firm has lately laid down a shipyard there. There is also Stevenston, with the largest works in the world—Messrs. Nobel's—for the manufacture of high explosives. Of the 102 furnaces in blast in Scotland 31 are directly connected with the Glasgow and South Western Railway.

Whilst mention has been made of prosperous towns on the system, there are large tracts of country along its route of a purely agricultural nature, and for the traffic arising therefrom special provision is made. The cattle trade is a large one. Large quantities of grain and hay are also grown and pass by rail, but the heaviest traffic in farming produce consists of potatoes. Enormous quantities pass chiefly from Ayrshire to all parts of England and Scotland.

The success of the Glasgow and South Western Railway has been largely due to constant and consistent efforts to give a good service to all traffic. Between their own stations elaborate and carefully thought-out arrangements exist which result in traffic being conveyed to its destination with the maximum despatch. As for English traffic, the arrangements are equally good. Vacuum-fitted trains run between Glasgow and Carlisle in both directions. These trains are run to suit the arrival and departure of the English Companies' trains. It may be added that the Glasgow and South Western Railway Company have very complete arrangements for dealing expeditiously with transhipment traffic at their Carlisle,

CATTLE TRAIN AT GREENOCK HARBOUR GOODS STATION.

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Dumfries, Kilmarnock, Johnstone and Ayr Stations.

With such a water-front as that possessed by the Glasgow and South Western Railway it is fitting they should be interested, even to the extent of ownership, in harbours and piers. The chief of these is Troon Harbour. Besides having all modern appliances and tools for dealing with the large import and export traffic which passes through it there is a flourishing shipbuilding yard, and dry docks for ship repairing immediately connected with the harbour. It may interest readers to know that the first locomotive engine in use in Scotland ran between Kilmarnock and Troon Harbour. It was the second one built by Stephenson and was made to the order of the Duke of Portland in 1817, to whom Troon Harbour, as it then was, belonged.

The disastrous results of the outbreak, in March, 1912, of Foot-and-Mouth-Disease were much felt by the Glasgow and South Western Company, and with their customary enterprise they were the first of the railway authorities in Scotland to provide isolation premises for the reception of cattle from Ireland when the Board of Agriculture and Fisheries, by relaxing their regulations, made the use of such premises possible. At the present time the Company has an ownership interest in lairages at the ports of Stranraer, Ayr and Greenock. The most important of these and the largest is situated at the last-named place. It is erected on Prince's Pier, and the site is ideal in every respect. On the one side the animals pass direct from the ship to the lairage and on the other from the lairage to the cattle loading bank where they are trucked for despatch by rail, so that practically all foot-travelling is obviated, a most important consideration in the case of fat stock on the way to market. Stock trains are arranged to depart at times to suit the hours when the animals are free of the lairage. At present the detention period extends to ten hours. During that time the animals are examined by the Government Inspectors and the Railway Company sees to them being fed and watered and otherwise cared for.

Whatever may be thought by cattle dealers and others interested of the little extra cost per head involved in being obliged to use these detention premises, all are agreed that the animals greatly benefit from the enforced rest after the sea journey, in premises such as have been erected at Greenock, and that their selling value when going direct from the lairage to the market is increased. The Company has been highly complimented on the condition in which they deliver cattle through their lairages to the Glasgow Cattle Market. It should be mentioned that they are assisted in doing this by the fact that the exit from their Glasgow cattle station, Bellgrove, is next door to one of the principal entrances to the Cattle Market.

The Glasgow and South Western Railway is fortunate in many respects in the compactness of its concerns: two of these may be mentioned. It is practically independent of assistance from owners of private wagons,

MINERAL TRAIN AT AYR DOCK.

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a position occupied by few Railway Companies having an equal coal tonnage; it has an efficient stud of horses at all the chief stations and is thus able to deal itself with the cartage of its traffic. Reference to cartage recalls that the Company have a fully-qualified Veterinary Surgeon devoting his full time to their fine stud of horses. The Company has its own Saddlery Department where new saddlery is made and repair work carried out, also a Smithy and Cartwright's Department. A large Provender Mill is located at Glasgow where the provender is made up and despatched to all points on the line where the Company have horses. The Company also make and keep in repair their own wagon tarpaulins and lorry covers and have large premises for that purpose.

The various railway interests touched upon in this article are all connected with the Goods Department of the Glasgow and South Western Railway. The Goods Manager, Mr. John Robinson, although he has been in the service for the long period of thirty-six years, is still in the prime and vigour of life. He began his railway career at a country station and, graduating through the different departments at quite a number of stations, he was eventually selected for headquarters and succeeded to his present position nine years ago. It may be mentioned that Mr. Robinson acted as Chairman of the Goods Managers' Conference for the year 1913, having been elected to that office by the unanimous vote of the other Goods Managers of the United Kingdom.

Photo] [*Lafayette, Ltd.*

MR. JOHN ROBINSON,
Chief Goods Manager,
Glasgow and South Western Railway.

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What Scottish Manufacturers are doing for Railways.

THE CONSTRUCTION OF RAILWAY ROLLING STOCK BY MESSRS. HURST, NELSON & CO., LTD.

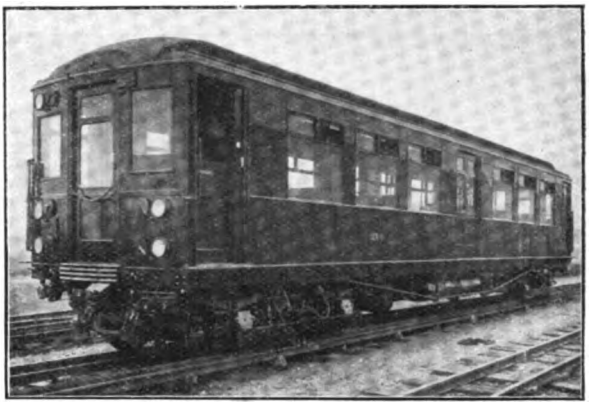

FIG. 4. ALL-STEEL CAR: METROPOLITAN DISTRICT RAILWAY.

A HIGH standard of construction and equipment of railway rolling stock for passenger traffic is necessary, whether the vehicles are for home railways or for use in the Colonies, South America and other countries; but it is in the goods and mineral departments that special features and constructional methods are most in evidence. In the former division ordinary vehicles are amplified by many special cars, including lavatory, restaurant, sleeping and like accommodation; but as a rule these may be described as fairly straightforward developments of the usual modern standards, interesting and notable but hardly exceptional, a few special vehicles constituting rather the exceptions which prove the rule.

For goods and mineral rolling stock, however, there is considerable opportunity for special development, owing to the necessity for providing for the conveyance of unusual loads, great weights and meeting the demands of widely varied traffic. When it is further necessary to provide for the needs of railways in countries where peculiar traffic and climatic considerations are added to requirements affecting manufacture, maintenance and repair in districts where repair shops are few and far between, and not always well equipped at that, and for convenience of erection after transport in sections from the makers to the scene of work, it follows that design and construction become more involved, and a special branch of practice has to be developed.

In order to meet these demands several firms have introduced special equipment and methods, which have largely influenced the specifications prepared by the engineers of Colonial, South American, and foreign railways and to which orders are usually completed; while in other cases these firms are themselves responsible for design as well as construction. For such vehicles pressed steel is being extensively adopted, and is used also for many vehicles supplied to home railways. Other notable features are also included; and a brief review may therefore be given of work done by the principal firm catering for this branch of industry in Scotland—Messrs. Hurst, Nelson & Co., Ltd., of the Glasgow Rolling Stock and Plant Works, Motherwell. Indeed, with the exception of the Metropolitan Carriage, Wagon and Finance Co., Ltd.—a combination of several concerns—Messrs. Hurst, Nelson & Co., Ltd., rank as the largest manufacturers of railway rolling stock in the United Kingdom.

Before dealing with freight vehicles a few passenger carriages may be referred to. Fig. 1 illustrates a fine bogie composite carriage 53 ft. 2 in. long, built for the Glasgow and South Western Railway to the designs of Mr. Peter Drummond, Locomotive Superintendent. This represents the latest practice on this line, with three first class and five third class compartments. Electric lighting, steam heating and other details of equipment are included. Pressed steel bogies are employed. This carriage is one of an order for 13 recently completed, and Messrs. Hurst, Nelson & Co. are now engaged on an order for 19 bogie corridor carriages for the same railway company.

Fig. 2 illustrates a modern first class carriage built for the North British Railway to the designs of Mr. W. P. Reid, Locomotive Superintendent. This vehicle is 58 ft. 4 in. long over body, with eight compartments, and is fitted with electric

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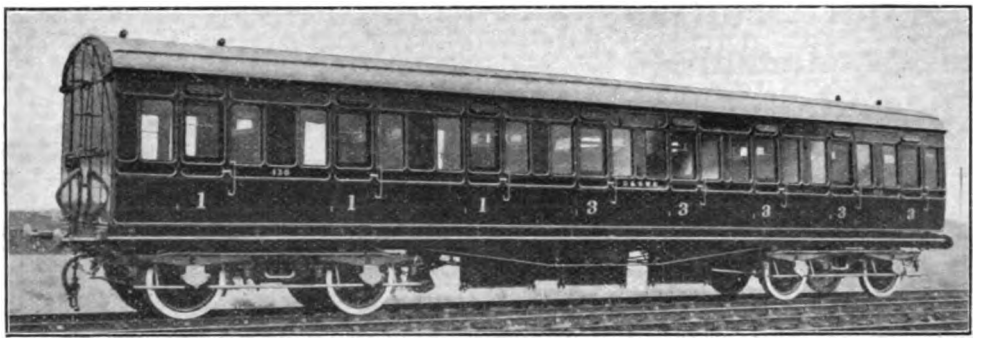

FIG. 1. COMPOSITE CARRIAGE: GLASGOW AND SOUTH WESTERN RAILWAY.

light and steam heating. The bogie frames are of pressed steel.

A composite carriage with side corridor lavatories and vestibules, built for the Highland Railway to the designs of Mr. P. Drummond, late Locomotive Superintendent is shown in Fig. 3. This is also carried on pressed steel bogies. Length of this vehicle is 52 ft. over body.

Among other British passenger vehicles constructed by Messrs. Hurst, Nelson & Co., Ltd., may be specially mentioned 52 all-steel cars for the Metropolitan District Railway, one of which is shown in Fig. 4. The cars are non-inflammable. The inside mouldings, window and door frames are of mahogany, but the timber has been specially treated and rendered fireproof. Seating capacity 48. Length 49 ft. 9 in.

For colonial and foreign railways a wide selection of interesting vehicles is available for consideration, but one will be sufficient for present reference. This is a composite first and second class carriage with kitchen and lavatory accommodation (Fig. 5) built for the Midland Railway of Uruguay. It is

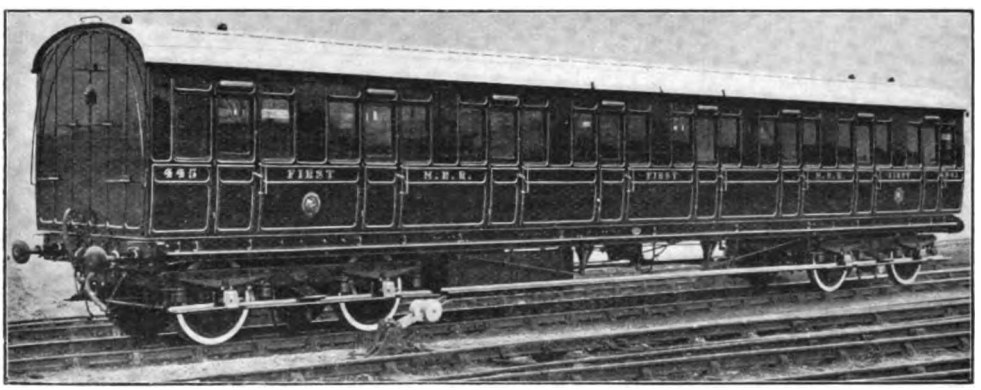

FIG. 2. FIRST CLASS CARRIAGE: NORTH BRITISH RAILWAY.

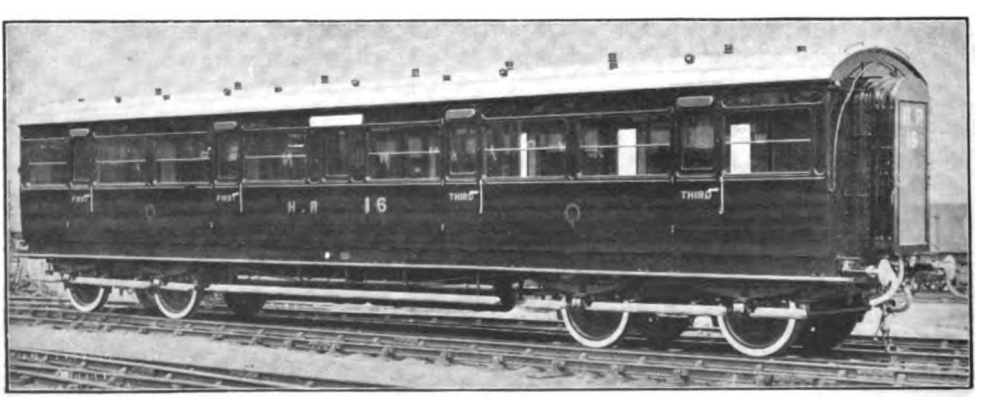

FIG. 3. COMPOSITE CORRIDOR CARRIAGE: HIGHLAND RAILWAY.

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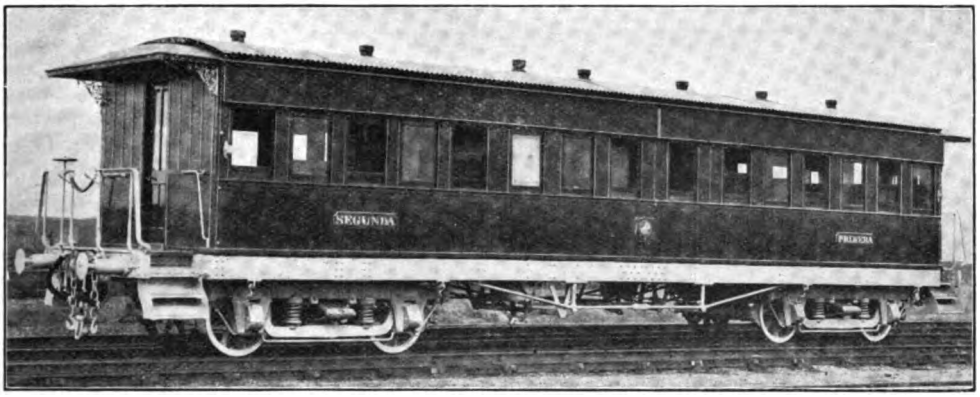

FIG. 5. COMPOSITE CARRIAGE: MIDLAND RAILWAY OF URUGUAY.

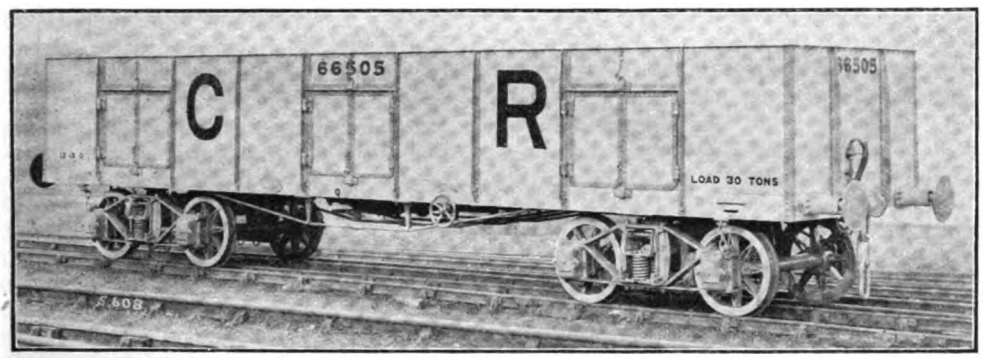

FIG. 6. 30-TON ALL-STEEL BOGIE COAL WAGON: CALEDONIAN RAILWAY.

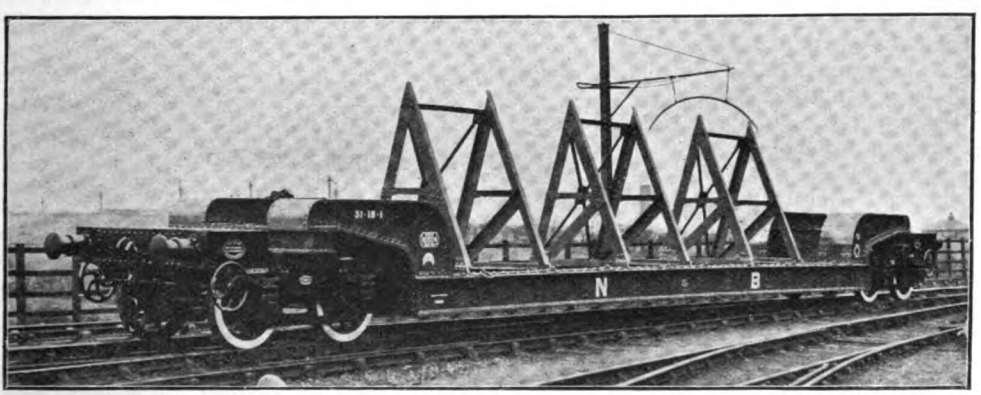

FIG. 7. 30-TON "RULLEY" WAGON: NORTH BRITISH RAILWAY.

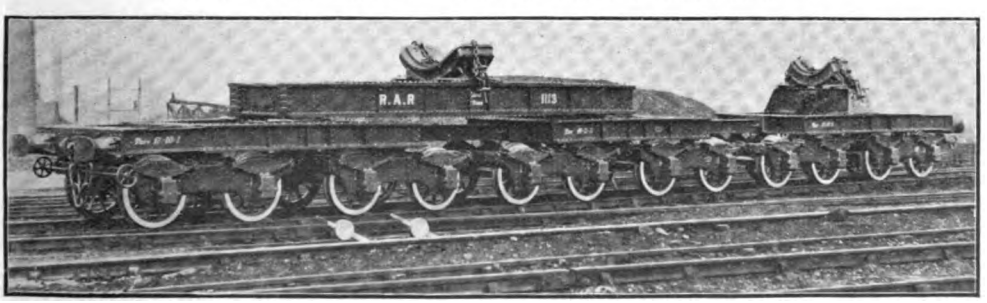

FIG. 8. ROYAL ARSENAL RAILWAY GUN WAGON.

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FIG. 9. ALL-STEEL NARROW-GAUGE COVERED GOODS WAGON: SOUTH INDIAN RAILWAY.

49 ft. long over platforms. The finish outside is varnished teak natural grain.

In the case of the home railways the most remarkable goods and mineral vehicles are the large bogie coal and trolley wagons for heavy and special loads. Fig. 6 illustrates a large 30-ton all-steel bogie coal wagon for the Caledonian Railway. This wagon is 35 ft. long and the tare is only 13 tons. 13 cwts. Westinghouse Air brakes are fitted.

For the North British Railway several special "trolley" or "rulley" wagons have been built to the designs of Mr. W. P. Reid, Locomotive Superintendent, including flat, well and other vehicles, some with supports and other appliances to enable exceptional loads to be dealt with. Fig. 7 shows a 30-ton "rulley" wagon of this class. As will be seen this wagon has a very long and low frame for the transport of bulky loads. The trestles for supporting plates are detachable. Length of Well 36 ft. Length over buffers 64 ft. 4½ in.

Fig. 8 illustrates one of the most remarkable railway vehicles in Great Britain. It is one of several supplied to the War Office for use on the system of railways at Woolwich Arsenal, and designed to carry guns up to 130 tons weight. The three sections, each carried on two four wheeled bogies — pressed steel construction—have, of course, steel framing, and two of them carry a pivoted beam on which one of the supports is mounted, the other support being on the third section. Total length over buffers is 66 ft. 3 in.

An all-steel covered goods wagon for use on the 2 ft. 6 in. gauge section of the South Indian Railway, including presed steel underframe and bogies is shown in Fig. 9. Length, 25 ft. over headstocks, width 7 ft. over body plates. This is a typical Indian Narrow Gauge Wagon. Fig. 10 illustrates a large tank wagon for the Bengal Nagpur Railway (5 ft. 6 in. gauge) all steel construction. Length over headstocks 24 ft.

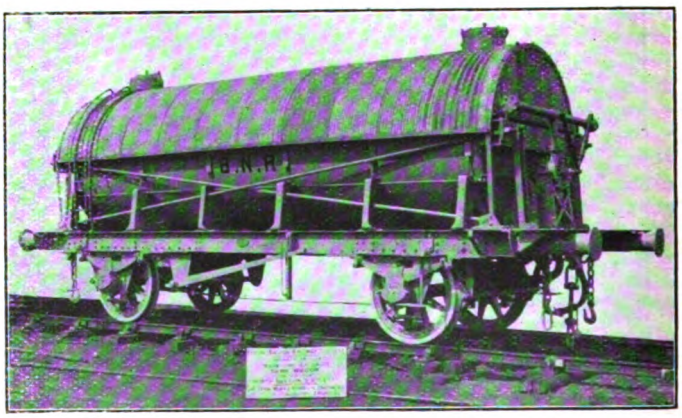

FIG. 10. BROAD GAUGE TANK WAGON: BENGAL-NAGPUR RAILWAY.

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The Road Motor Services of the Great North of Scotland Railway.

THROUGH PICTURESQUE SCOTLAND BY MOTOR CHAR-A-BANC.

THE list of railway companies which have introduced motor road vehicles for passenger and parcels traffic on routes designed to provide feeders for the train services is a fairly lengthy one; but it is doubtful whether in proportion to mileage and the character of the country involved, any railway provides a real comparison with the arrangements made by the Great North of Scotland Railway. Indeed, this railway is one of the largest users of "public service" motor road vehicles, with a fleet of 43 vehicles, which includes 8 steam lorries. These consist of single and double deck motor 'buses and char-a-bancs, the chassis having been supplied by Messrs. Milnes-Daimler, Maudslay, Straker Squire, and Durkopp, while the bodies were built at the Railway Company's Works. The steam lorries were supplied by the Yorkshire Engine Company, Foden, Ltd., and Messrs. Alley & MacLellan.

MOTOR CHAR-A-BANC: GREAT NORTH OF SCOTLAND RAILWAY.

Combined rail and motor tickets are issued, the road routes being considered as extensions of the railway, but intermediate traffic is also conveyed as far as seats are available. In several instances booking clerks are required to wire through to the starting station of the road service the number of passengers booked therefor, and seats can be reserved by arrangement with stationmasters. Small hand luggage is carried free, and other luggage, except of inconvenient size and weight, is conveyed at reasonable rates. A considerable parcels and bicycle traffic is also dealt with. The motor road services also include the "Three Rivers Tours," Dee, Don, and Spey, which are arranged during the summer months. Some of the services are necessarily confined to the holiday period, but most of them apply all the year round, with the proviso that "when the roads are heavy the omnibuses running towards the railway stations will start from the termini 15 minutes earlier than the booked times," and that "during snowstorms, when the roads are difficult or blocked, it may be necessary to curtail the service without previous notice."

The full list of services in operation during the summer is:—

(1) Ballater to Braemar—17 miles; five each way, and a morning mail service on Sundays in either direction.

(2) Alford, Kildrummy, Strathdon and Corgarff—28½ miles; one each way over the whole route and one (two on Saturdays) between Alford and Strathdon.

(3) Huntly and Aberchirder—

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11¾ miles; two services (one extra on Saturdays) each way.

(4) Fraserburgh, Rosehearty, and New Aberdour—12 miles; 7 each way daily (8 on Saturdays) with Rosehearty, and 2 each way with Aberdour (3 on Saturdays).

(5) Aberdeen, Echt and Midmar—16 miles; two, three or four, according to day of the week, to Echt, and one to Midmar.

(6) Aberdeen and Cluny—16 miles; two, three or five services, according to day of the week.

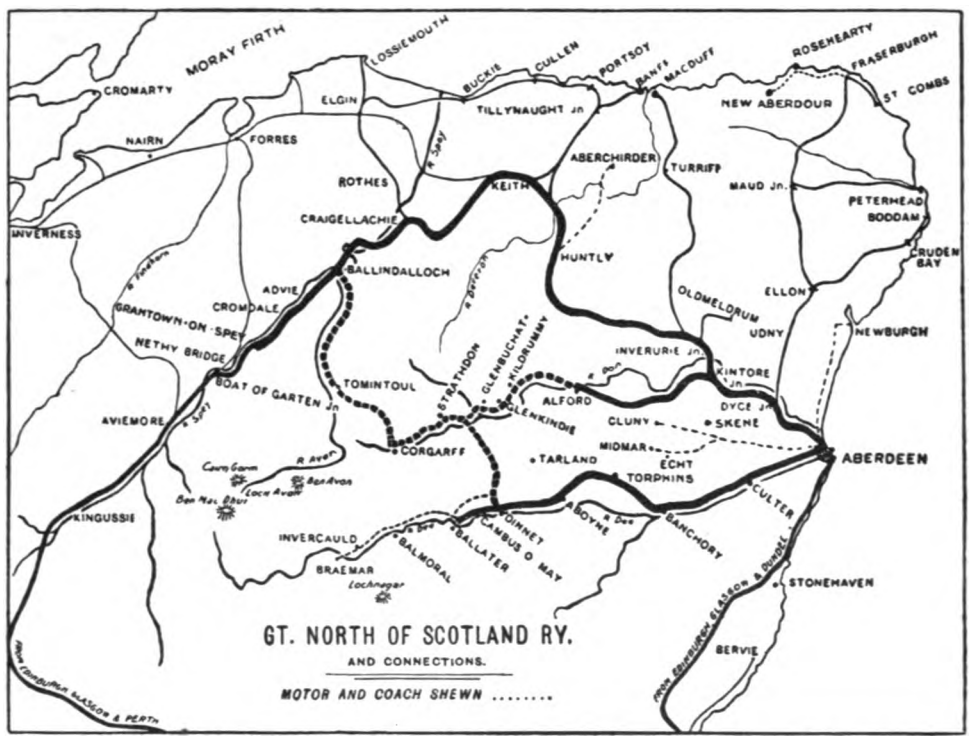
(7) Aberdeen and Newburgh—14¾ miles; two or three services, according to day of the week.

(8) Ballindalloch and Tomintoul—15½ miles; two services.

Nos. 5, 6 and 7 are noteworthy in that they do not run in connection with trains, except as regards through and interchange passengers from or to stations beyond Aberdeen, as they run to and from Schoolhill station in Aberdeen.

All these services are in special favour, as they provide an admirable means of traversing the wonderful scenery of Aberdeenshire and Banffshire at reasonable rates and in a convenient way, while at all times they constitute what are virtually extensions of the railway system. There are also several privately owned motor and coach services operating in connection with the railway, though the company accepts no responsibility in reference to them.

An unusual feature is the steam lorry service for goods traffic on the Aberdeen, Skene, Waterton, Echt and Midmar route. In other cases a steam lorry is placed on a special railway truck and is conveyed, with its load, by rail to a convenient station, there commencing a tour for unloading or loading goods traffic, returning to the same or another station for return to Aberdeen or as required.



MAP SHOWING THE MOTOR AND COACH ROUTES OPERATED BY THE GREAT NORTH OF SCOTLAND RAILWAY.

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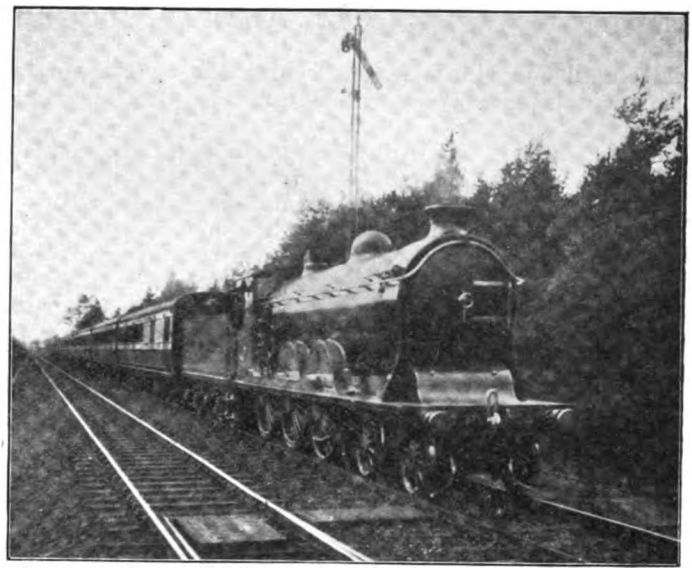
Caledonian Railway Impressions.

By

J. F. GAIRNS.



Photo] [*J. Cheyne.*

10 A.M. GLASGOW–ABERDEEN EXPRESS PASSING GLAMIS :
4–6–0 locomotive (6 ft. 6 in. class, Schmidt superheater) No. 905.

AS the northern partner in the West Coast combination the Caledonian Railway is an important factor in Anglo-Scottish railway inter-communication, and is further notable in that, as regards traffic passing by the West Coast route, it is the active agent from the border station—Carlisle—to all places beyond, whether for Glasgow, Edinburgh, Perth, Dundee or Aberdeen, or destined for the Highland, Great North of Scotland and Callander and Oban Railways.

Most southerners make their first acquaintance with the Caledonian Railway at Carlisle, perhaps the most interesting station in the Kingdom, though at times, between the periodic rushes of traffic, it can only be described as "deadly dull." Here, between 4 and 6 a.m., 12 noon and 1.30 p.m., 3.30 and 4.30 p.m., 8 and 11 p.m., and 1 and 2.30 a.m., may be seen train after train belonging to the various companies which use the station, all except those of the North Eastern and Maryport and Carlisle Railways, and a few local and secondary trains, involving a change of engines and handing over by one company to another. Of these trains the larger proportion are "horsed," for Scottish working, by the famous blue engines; and at all periods are to be seen the most interesting locomotives included in Caledonian equipment. "Dunalastairs" of the second series, the 900 class and the 140 and corresponding superheater designs provide an interesting array of 4–4–0 locomotives, nearly all taking trains which are fast (both relatively and actually) and heavy, while Nos. 49 and 50 and Nos. 903 to 907 add further interest as representatives of the 4–6–0 type. Other classes, except perhaps an occasional tank engine working one of the very few short distance locals, and goods engines in the adjacent goods station, are very exceptional.

Leaving Carlisle with the smartness characteristic of most Scottish locomotives the run to Beattock is usually made in good time, and here, unless double-headed from Carlisle, a stop is made for water and to attach a banking engine—generally a 0–4–4 tank engine—by means of a slip coupling. Instances are on record of the ascent of the famous bank being made without assistance and with substantial loads; but they have never come within the writer's experience. The bank is usually climbed in good style, and the ascent provides much that engages the attention, this part of the line being very picturesque though the country is comparatively desolate. At the summit a stop is made by double-headed trains to detach the pilot and for water, but banked trains continue without stopping, the assisting engine being "slipped" and dropping behind.

Fast running is then made on the other

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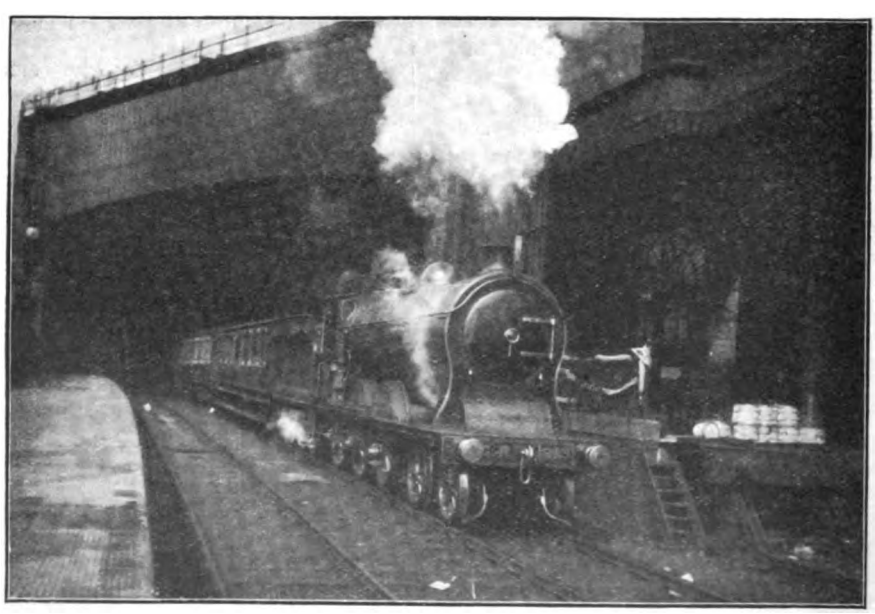
side, until Carstairs is reached, either for stopping there or at Strawfrank Junction outside, or in order to traverse the curves slowly. The train working here is somewhat curious, as the Edinburgh portion may be detached outside and taken on by an engine attached in front, or uncoupled in the station and taken out by an engine in the rear. Occasional divisions at Symington add further diversity to the methods in force.

Approaching Law Junction and Wishaw the industries of the Glasgow district take the place of scenic attractions, but the surroundings of the line, whether journeying to Glasgow or diverging towards Stirling and Perth, continue to be interesting, industrially if not scenically. As for the railway complications of this area it is best not to say too much. It requires a resident to appreciate them fully, and it is necessary to confess that the writer has not yet been able to understand the railway geography of this area except in a superficial manner.

Southbound the journey from Glasgow is principally characterised by heavy pulling, usually without assistance, nearly all the way to Beattock summit. The impression conveyed is that it is really much harder than from Carlisle, the latter having the gradient difficulties largely concentrated in Beattock bank, while southbound engines have collar work for nearly half the journey.

There are few finer stations than Glasgow Central, with its wide circulating area, and spacious platforms. Here are to be seen engines of all classes. Large 4–4–0 locomotives on the standard main line trains, with a few 4–6–0's on specific services; the first "Dunalastairs," with a few older locomotives of rebuilt classes on the Edinburgh expresses, and the same engines with the addition of the 5 ft. 9 in. 4–6–0 mixed traffic and some of the 0–6–0 goods engines (with and without superheaters) on the Clyde coast services operated mainly at the further platforms on the arrival side; tank engines—0–4–4 type, with 4 ft. 6 in. and 5 ft. 9 in. coupled wheels—on the Cathcart Circle and general local services dealt with in the centre of the station, with a sprinkling of black ones fitted with condensing apparatus to lend variety; and a few of the old outside cylinder 2–4–0 and 0–4–2 locomotives on suitable duties or acting as shunters.

Rolling stock to be seen here includes all classes of vehicles, from the magnificent West Coast Joint Stock and the set trains used for Edinburgh–Glasgow traffic and for the principal coast services, to the older bogies, six-wheelers and four-wheelers (some of the last mentioned painted very dark blue) which still take a share in the suburban traffic. The question may be raised whether any other company does



Photo] [*G. Boyd Hutchinson.*

CLYDE COAST EXPRESS LEAVING GLASGOW (CENTRAL): 4–6–0 ENGINE (5 FT 9 IN. CLASS) No. 913.

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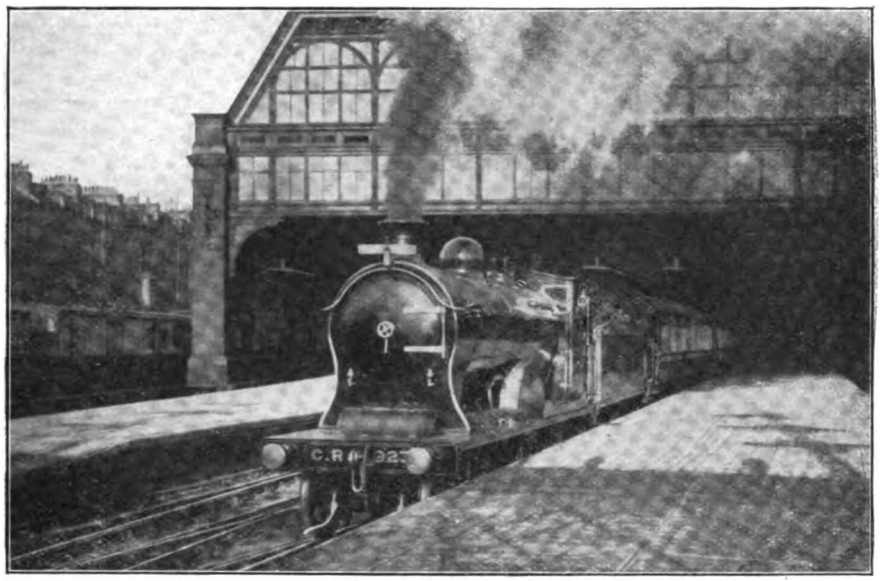

Photo] [*D. McBean.*

LONDON EXPRESS LEAVING PRINCES STREET, EDINBURGH: 4–4–0 LOCOMOTIVE, NO. 923.

so much in the way of allocating sets of vehicles to particular services as does the Caledonian. In addition to the main line sets there are block trains of eight and twelve-wheelers not only reserved but permanently lettered for the Edinburgh–Glasgow, Glasgow–Gourock, Glasgow–Wemyss Bay and other specified routes. Some of these, though ranking as expresses and taken by express engines, work to and fro in the manner usually associated with suburban traffic; an engine being attached in rear shortly after arrival ready for the next journey on the route to which the trains belong. Many of these special trains are fine examples of the carriage-builders' art, and are well worthy of examination, besides being comfortable for travelling.

The coast services of the Caledonian Railway afford an absorbing study. They are numerous and many are timed very smartly in view of the gradients and traffic difficulties. Most of the principal trains run in connection with the steamers, which may almost be said to constitute extensions of the railway to places along the Clyde estuary necessarily inaccessible by rail. Two records of runs with these trains may be briefly referred to.

A goods engine with a load of 9 ordinary bogie coaches was working the 8.30 a.m. out of Glasgow Central. Starting very smartly, Paisley (Gilmour Street) was passed at slightly reduced speed in 11 min. (7¼ miles), and good running brought us to Port Glasgow, the first stop, in 27¼ min. (20¼ miles). High speed is difficult beyond owing to curves and other hindrances, but the remaining 6 miles to Gourock were covered in barely 11 min., the complete run of 26¼ miles having been made, with one stop of 40 sec., in 38 min. 40 sec. On a return train booked to call at Paisley only, No. 723 (4–4–0, first "Dunalastair" class) had 5 twelve-wheelers and 3 eight-wheelers. The earlier stages are very difficult, 9 min. 25 sec. being required to pass Greenock Central, but onwards to the Paisley stop the 15½ miles were covered in barely 20 min. The remaining 6¼ miles to Pollokshields, start to stop, occupied barely 10 min.

One can hardly call this route scenically inviting and it is not so attractive as the Glasgow and South Western route to Greenock with its magnificent climb over the hills above Port Glasgow, but there is much to be seen on the way, especially as one follows the riverside. It is, however, when one travels by Caledonian steamer down the Clyde that one appreciates the attractions which the famous Firth has for Glaswegians. This phase will be further dealt with on another occasion. Mention may be made, however, of the fact that personal inspection entirely concurs with the generally expressed opinion that Wemyss Bay station is one of the

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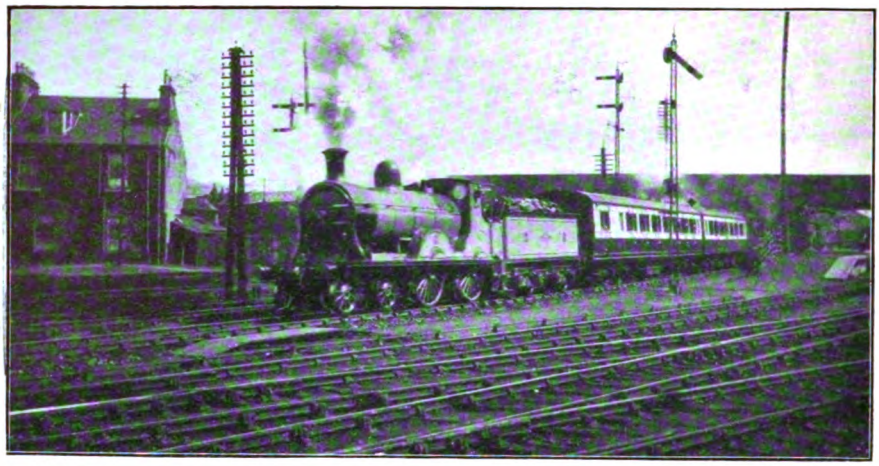

Photo] [*R. A. Chrystal.*

EXPRESS LEAVING STIRLING: 4–4–0 LOCOMOTIVE NO. 778.

prettiest and most attractive stations of its class in the Kingdom.

Buchanan Street station suffers considerably by comparison with Glasgow Central as regards architecture and arrangement, but it is really a terminus of an altogether different character and must be appraised on a distinct basis. Princes Street, Edinburgh, is on the other hand a worthy companion to the principal Glasgow terminus. Many of the smaller stations on the Caledonian are also of interest in various ways.

North of Glasgow, whether the main line is reached from Buchanan Street or *viâ* the local lines from the Central station, or direct from the south, through the complicated Holytown and Wishaw area, there is considerably industrial interest, until the country becomes more or less agricultural. At Larbert, Stirling and Gleneagles inter-connecting trains are met with; but it is at Perth that the complexities of traffic are most apparent. Here the Caledonian, North British and Highland Railways, each with its own goods yards, engine sheds, etc., are

Photo] [*F. E. Mackay.*

PERTH–EUSTON EXPRESS NEAR FLORISTON:
Superheater locomotive No. 121.

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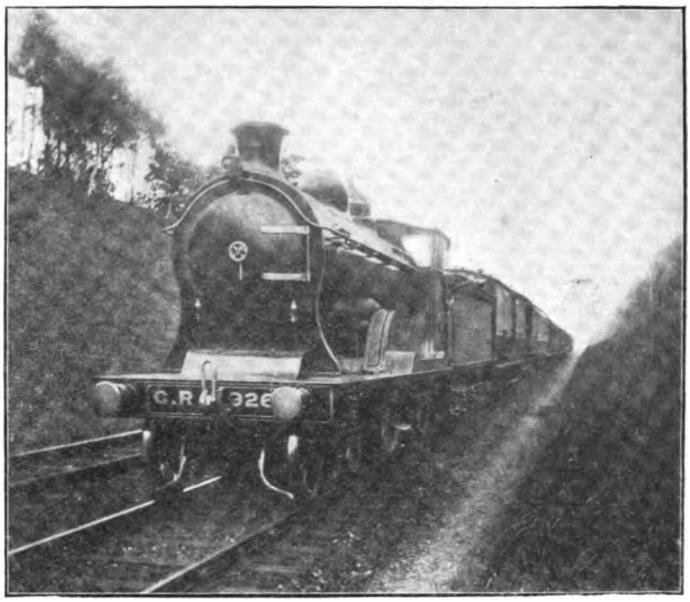
brought into association. The connections with the principal Highland services render the station a busy one at certain periods of the day, particularly from 4.30 to 6.30 a.m., 11 a.m. to 1 p.m., 3 to 6 p.m. and 7 to 8.30 p.m. Engine changing and interchange of trains between the respective companies, as well as the traffic of the station itself, create many outstanding features. In the early morning the arrivals of the Highland sleeping car trains from London are well worthy of watching, and their departure is usually associated with a considerable amount of excitement, particularly during the summer months and when traffic is very heavy. Then comes the postal train, with its attendant transhipment of mails. Later in the day the connections and inter-connections are more comprehensive.



Photo] [*J. Cheyne.*

10.5 A.M. ABERDEEN–LONDON EXPRESS PASSING GLAMIS: 4–4–0 LOCOMOTIVE NO. 926.

North and east of Perth there is less of special note until Aberdeen is reached; but at the joint station in the "Granite City" complex inter-connecting and terminal traffic is involved, the Caledonian, North British and Great North of Scotland Railways being here associated. The "Grampian" and "Granite City" trains provided by the Caledonian Company for the Aberdeen traffic are composed of splendid vehicles, and well maintain Caledonian characteristics in the northern area. On this section the large 4–4–0 locomotives of the 140 and superheater classes are mainly in evidence, with some of the 5 ft. 9 in. and 6 ft. 6 in. 4–6–0's, but relatively few trains travel long distances without stopping, though the intermediate schedules are in several instances very tight. Scenically the concluding section from about Stonehaven appeals strongly to the visitor, the rocky coast and other natural features being very impressive.

Much could be said in reference to the Callander and Oban line and various branches and the subject will receive further attention. at a subsequent date; but for the present it may be said that one's impressions of the Caledonian Railway are distinctly favourable. The sportsman, the angler and the tourist are well catered for by the "True Line." The railwayist is provided with abundant subject matter for observation, and as a rule he will leave the Caledonian Railway with the intention of revisiting it at an early opportunity.

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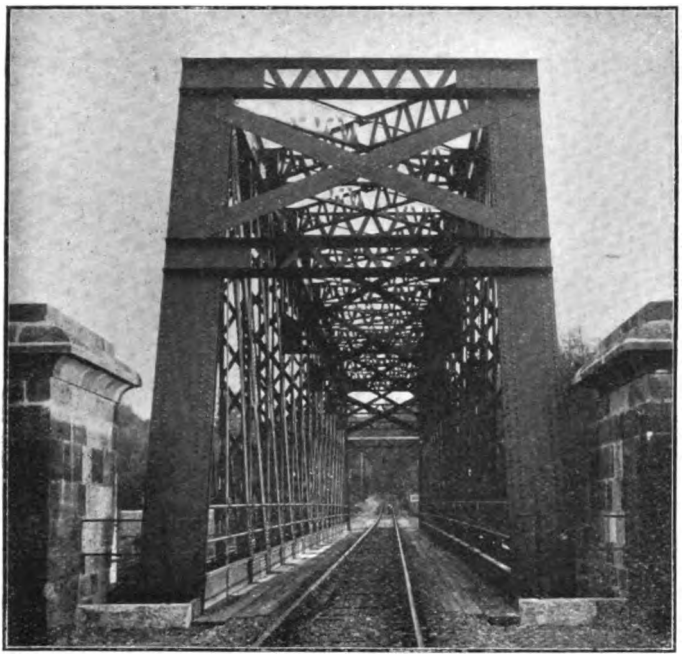

SPEY BRIDGE, ORTON. 230 ft. span.

The Highland Railway and its Chief Engineers.

THE retirement of Mr. William Roberts from the position of Chief Engineer of the Highland Railway Company and the appointment of Mr. Alexander Newlands to succeed him, are matters of more than passing interest, in view of the fact that both gentlemen have been associated with many of the noteworthy engineering works which have been undertaken by the Highland Railway Company during the past quarter of a century. Mr. Roberts left private practice, as a Civil Engineer at Kingussie, in 1891, to become Assistant Engineer to the Highland Railway; and in 1898, on the death of Mr. Murdo Paterson, he became Chief Engineer. Mr. Newlands was appointed Chief Assistant to Mr. Roberts at the same time, and became Assistant Engineer in 1902.

Comparison of these dates with the engineering history of the Highland Railway indicates that they have been largely or wholly responsible for the carrying out of the most important extensions and engineering works on the Highland Railway, including the Strome Ferry—Kyle of Lochalsh section of the Skye line (completed in 1897), the "direct line" from Aviemore to Inverness (opened throughout for traffic November 1st, 1898), the Dornoch Light Railway (opened June 2nd, 1902), the Wick and Lybster Light Railway (opened July 1st, 1903), and the double-tracking of 25 miles of the southern main line—Blair-Atholl to Dalwhinnie across Drumochter—as well as the improvement and modernising of the system as a whole.

Many of these works have entailed the construction of deep rock cuttings, high embankments, and remarkable viaducts, with snow fences and other protective arrangements to meet the conditions which have to be faced in winter, and rank among the most notable railway engineering undertakings in the United Kingdom.

The direct line between Aviemore and Inverness realises a gain of 34 miles in distance, but at the expense of costly and difficult engineering works. From Aviemore the line runs direct to the North through a very finely wooded country, and rises at steep gradients for a distance of twelve miles, passing Carr-Bridge, seven miles from Aviemore. Carr-Bridge, lying amid the pine forest 850 ft. above sea level has, since the opening of the line, become a thriving and popular health resort.

Beyond Carr-Bridge, the line enters upon a tract of wild, uninhabited country. From this point onward, the construction of the railway involved high embankments

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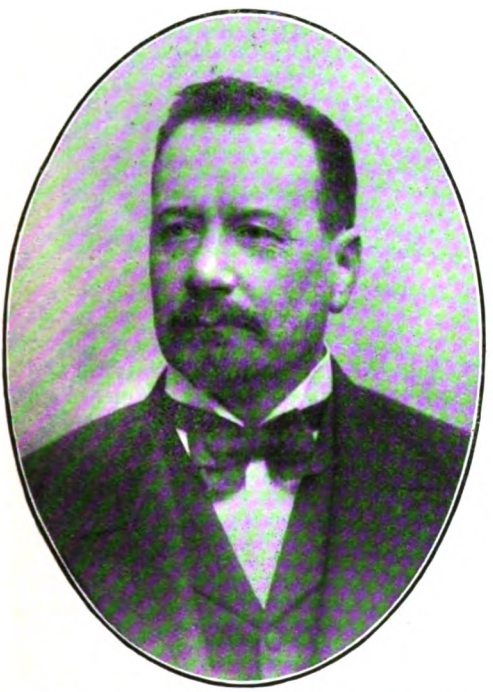
preceding deep cuttings, and viaducts of great length crossing gorges and valleys at considerable heights. The first viaduct of importance is at the Pass of Slochdmhuic. The viaduct by which the gorge is passed is 400 ft. long, and stands 110 ft. above the bed of the small stream in the centre of the gully. Emerging from the gloom of the pass, the train reaches an open, trackless expanse of furze and heather. Between two enormous cuttings, into which the train disappears, the summit level of this portion of the line —1,323 ft.—is reached. The excavation of the second cutting, which for some distance has a depth of 51 ft., involved the removal of the enormous quantity of 350,000 cubic yards of material.

Descending into the valley of Strathdearn, the river Findhorn is crossed near Tomatin by one of the largest viaducts on the line, its length being 445 yards, with a maximum height of 140 ft. The superstructure is of steel, resting on granite piers, and the bridge is formed on a curve with radius of half a mile. Before reaching Culloden Moor station a fine view is obtained of the great viaduct across the valley of the Nairn. Constructed entirely of old red sandstone, it is one of the longest, highest, and most graceful of the kind in Britain. The viaduct is 600 yds. long, and consists of 28 arches of 50 ft. span, and one across the river bed of 100 ft. span ; greatest height 130 ft. From Culloden Moor the line falls with a steep gradient to Inverness.

The extension of the Skye line from Strome Ferry is probably the most remarkable section of all. In many places the line traverses cuttings blasted from the solid rock and twists about in marvellous fashion to find a convenient route. This section is claimed to be the most expensive stretch of railway in the North, and cost about £250,000, of which £45,000 was defrayed by the Government of the day. On one side are the waters of the Kyle, on the other the mountain sides ; but, seen from the footplate while travelling, one has the impression of continually heading for the solid rock, only to find a deep cutting, unseen until almost reached, opening in front. Even at the terminus the space for the station and the



McMahon [*Inverness.*

MR. WILLIAM ROBERTS.

Retiring Chief Engineer: Highland Railway.

Whyte [*Inverness.*

MR. ALEX. NEWLANDS.

The New Chief Engineer: Highland Railway.

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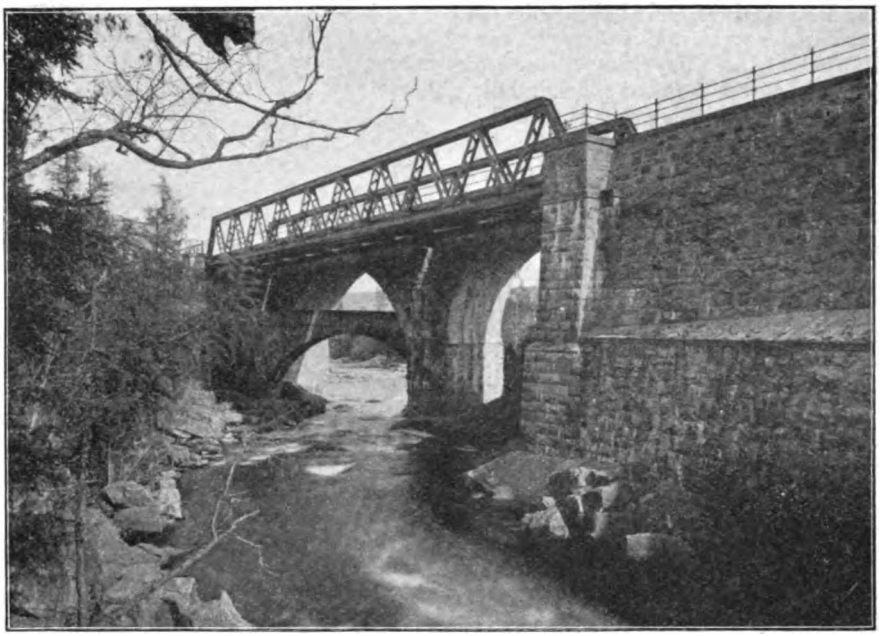

STRUAN VIADUCT, NEAR STRUAN STATION.

ROCK CUTTING NEAR KYLE OF LOCHALSH.

goods yard is cut from the rock. The station is on a platform at the water's edge, and steamers for the Hebrides ply in connection with certain trains.

The Dornoch Light Railway extends from The Mound station for about seven miles. Although technically a "light" railway, the standard modern rolling stock, including sleeping cars and saloons, can be run over it, and this is often done for the convenience of special parties. Here the Highland Company have provided an up-to-date hotel which is in considerable favour with golfing visitors. The Wick and Lybster Light Railway constituted a fairly straightforward piece of engineering. The doubling of the main line from Blair Atholl to Dalwhinnie was by no means a simple undertaking; and many of the other improvement and development works associated with recent history have also enabled both Mr. Roberts and Mr. Newlands to show their capabilities as railway construction and maintenance engineers. Mr. Newlands' new appointment takes effect from January 1st, 1914.

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Official Changes on the Portpatrick and Wigtownshire Joint Railway.

MR. F. W. HUTCHINSON has so long been responsible for the direction of affairs on the Portpatrick and Wigtownshire Joint Railway that his retirement is a matter of more than passing interest. In fact, his connection goes further, seeing that he entered the audit office at Stranraer of what was then the Portpatrick Railway as long ago as September 3rd, 1861. Mr. Hutchinson has, therefore, been associated with the fortunes of the Portpatrick and Wigtownshire Joint line, or one of its components and predecessors, for the long period of 52 years. His railway service with the Caledonian Railway from August 13th, 1856. adds another five years to his official career,

Photo] [*Abernethy.*

MR. W. MCCONCHIE.

Secretary and Traffic Manager, Portpatrick and Wigtownshire Railways Joint Committee and the Larne and Stranraer Steamship Joint Committee.

From 1864 to 1871 Mr. Hutchinson was employed in the Traffic Manager's office at Stranraer, under the Caledonian Company. In 1871 he become station agent at Stranraer. Twelve years later he was appointed

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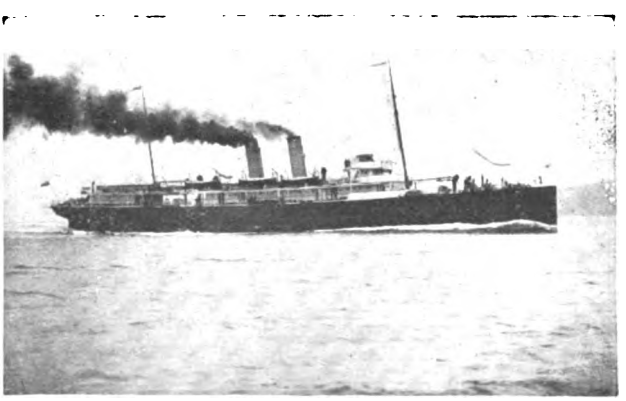
Secretary and Manager of the Portpatrick and Girvan Joint line between Challoch Junction and Stranraer Harbour. In 1895 he was selected to be Traffic Manager of the Portpatrick and Wigtownshire Joint Railways, including the Management of the Portpatrick and Girvan Joint line; and in 1907 he became Secretary also of the Portpatrick and Wigtownshire Railways and of the Larne and Stranraer steamers.

In the "fifties" the projectors of the section of line from Castle-Douglas to Stranraer promoted their enterprise under the high-sounding of the "British and Irish Grand Junction Railway," and laid their plans for a connecting ship to bridge the sea. Humbler nomenclature marked the completion of their enterprise; but to-day under such unimaginative names as the "Portpatrick and Wigtownshire Joint Railways," and the "Larne and Stranraer Steamers," the route flourishes, as the embodiment of a grand conception, the realisation of a great idea, the "British and Irish Grand Junction."

The railway was opened through to Stranraer in 1861; and, though there were earlier attempts to establish a service, the Larne and Stranraer Steamship Company commenced in 1872 with sailings every week-day. Enjoying the prestige of having the shortest practicable sea-passage between Great Britain and Ireland, the route has ever been synonymous with the maximum of comfort for those to whom the fitful moods of the sea give concern. The owners of the route have always maintained upon it well-equipped and comfortable steamers, each fully abreast of the standards of its time. The turbine vessels of to-day are the *Princess Victoria* (1912), and the *Princess Maud* (1904), the reserve ship being the *Princess May*. The two former vessels are magnificently finished 20-knot boats.

During the nineteen years Mr. Hutchinson has been manager, the joint system has made steady progress as a revenue producer. On the other hand, there have been large, but doubtless necessary, expenditures in various directions. The East Pier at Stranraer, which is entirely the property of the railway companies, was practically reconstructed, and considerable outlays are being incurred from time to time in improving the permanent way so that it may properly handle modern engines and coaches.

Mr. William McConchie, who has succeeded to the combined positions of Secretary and Traffic Manager for the Portpatrick and Wigtownshire Railways Joint Committee and the Larne and Stranraer Steamship Joint Committee, has, it may be said, grown up with the route. A native of Wigtownshire, born in 1863, he joined the Portpatrick Railway in 1877 as a telegraphist. Passing through various clerkships, he became a stationmaster in 1882. In 1888 he was appointed Traffic Inspector for the Portpatrick and Wigtownshire Joint Railways; and in 1905 he was transferred to Belfast as Traffic Manager for the Larne and Stranraer Steamship Joint Committee. Now, consequent on the retirement of Mr. Fred W. Hutchinson, who has been so long and honourably identified with the route, the care of both the railways and the steamers has been entrusted to Mr. McConchie.



TURBINE STEAMER, *Princess Victoria*.
Larne & Stranraer Steamship Company.

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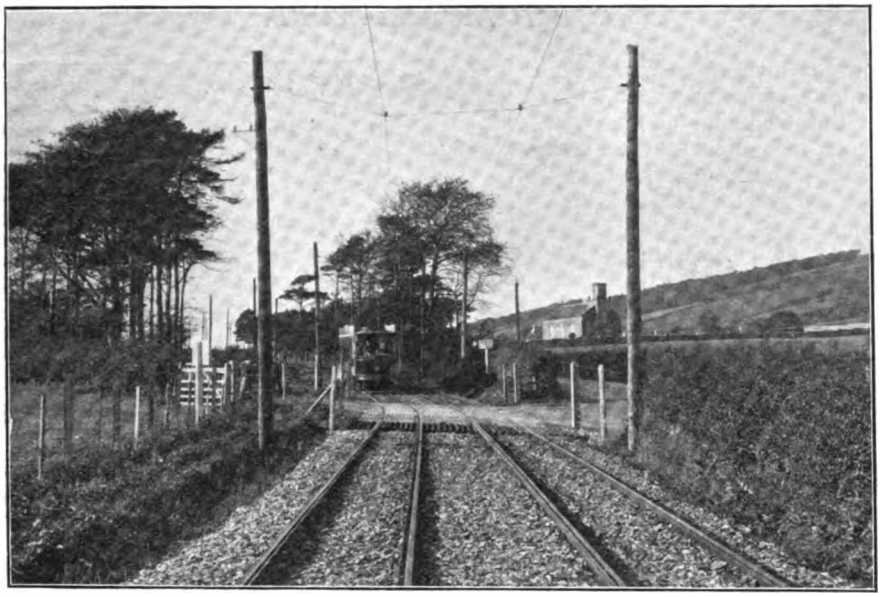

ON THE ROAD TO ETTRICK BAY.

Showing enclosed track, cattle guards at level crossing, and Croc-an-raar Church.

The Rothesay Tramways.

THIS undertaking was started in the old horse-car days, and at its inception was purely a local company. The route operated started from Guildford Square, Rothesay, to Govandale Place, Port Bannatyne, and was a single track, with passing places. There were 20 single horse-cars, and the schedule time was 30 minutes each way. The horse-cars ran for 20 years, but it was realised then that the needs of the district had outgrown the service, and eventually an arrangement was made with the British Electric Traction Company to take over and electrify the system.

The whole of the route was re-laid with double track and opened for traffic on August 19th, 1902. During the transition period passengers were conveyed by horse omnibuses. For some years afterwards these omnibuses ran from Port Bannatyne to Ettrick Bay in conjunction with the electric cars, but in 1905 it was decided to extend the track right through to Ettrick Bay and dispense with the road vehicles.

This extension is an interesting one, inasmuch as, with the exception of about nine chains of ordinary tramway construction in Port Bannatyne, it is laid on private right-of-way, the ground having been acquired by the British Electric Traction Company. The contractors for the permanent way were Messrs. Dick, Kerr & Co., Ltd. Rails used on this extension are of special construction and designed for fast running. The weight is 77 lbs. per yard, depth 5 in., with a table $2\frac{1}{8}$ in. wide, and groove $1\frac{1}{4}$ in. wide, by $1\frac{1}{4}$ in. deep. The lip is raised $\frac{3}{8}$ in. above the table, thus forming a very heavy check against derailment; consequently, Lieut.-Col. H. A. Yorke, R.E., at the Board of Trade inspection, sanctioned a speed of 25 miles per hour over this portion of the line, and expressed strong approval of the method of construction adopted. The rails are fastened to sleepers 7 ft. 9 in. long by $4\frac{1}{2}$ in. by coach screws with large heads. The joints are made by two fishplates 20 in. long, with four $\frac{7}{8}$ in. bolts, and are bonded with "protected" bonds fixed under fishplates.

Near the Port Bannatyne end of the line a slipway has been constructed across the track to enable yachts to be taken into a repairing yard. The rails of this slipway are entirely of manganese steel, and a tube has been laid under the track for the purpose of preventing the cable, used for hauling up the boats, interfering with the traffic. The tongues of all crossovers are 12 ft. long, built out of the ordinary rails, and designed so as

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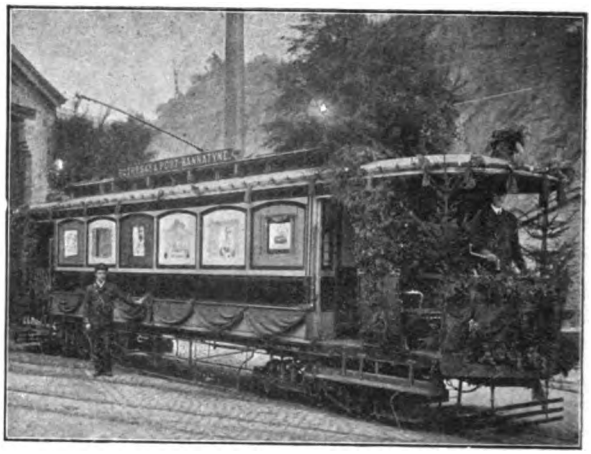
to allow for high speeds. At the Ettrick Bay terminus the lay-out of the lines admits of six cars loading or unloading at the same time, in addition to which a siding has been constructed to hold three extra cars.

Rolling stock consists of twenty single deck double truck cars, ten being of the Dick, Kerr standard open type, five of similar type supplied by the Brush Electrical Engineering Co, and five Dick, Kerr combination cars. The first named have seating accommodation for 50 passengers, and the two latter 46 passengers each. The open (or "toast rack") cars are exceedingly popular with the summer visitors, and adapt themselves readily to the rush traffic on busy days.



DECORATED CAR.

During the Glasgow Fair week, when the season is at its height, thousands of holiday-makers wend their way towards Ettrick Bay to enjoy the magnificent sands and water. The route lies through a fertile and picturesque valley and across the northern part of the Island of Bute, and the scenery from the cars can hardly be excelled anywhere. On leaving Port Bannatyne, the car ascends a fairly steep incline, and from behind passengers get a glorious view of Kames Bay, with Port Bannatyne nestling on one of its shores. In the background are the heather-clad hills of Argyllshire, broken up by the salt-water lochs of Ridden and Striven, and the eastern entrance to the far-famed Kyles of Bute. In the distance the hills of Ayrshire and Renfrewshire, and on particularly clear days those of Dumbartonshire and Lanarkshire, can also be discerned. The castles of Easter and Wester Kames, among the oldest inhabited castles of Scotland, are within 200 yards of the line. Shortly after leaving these the old parish church and manse are passed. Immediately opposite the church is Croc-an-raar (the "Seat of Judgment" in the olden times). This site, which is a circular piece of woodland of about a quarter of an acre in extent, is occupied by Hamilton's Tomb, and known as "The One Man Burial Ground." There are also several remains of Druidical origin, the most noticeable being a grove with a circle of standing stones known as the "Druidical Circle."

Ettrick Bay itself forms nearly a semi-circle of over a mile, and when the tide is out there is a fine stretch of sands over a quarter of a mile in width. In order to stimulate traffic, the Tramway Company has for several years held Sand Castle and Wild Flower Competitions at frequent intervals during the season. Some of the former have been worked in conjunction with the proprietors of a popular London weekly paper, and on those days, when special concessions are given in the way of cheap tickets to readers, the carrying capacities of the cars have been taxed to their utmost. Valuable prizes are given at these competitions, and the work done reaches a high level.

A handsome and commodious shelter, with seating accommodation for close upon 1,000 people, has been erected at the Ettrick Bay terminus. From the beginning of June to the end of September high-class entertainments are given twice daily at 3 and 8 p.m. by a specially selected company of London artistes, combined tramcar and admission tickets being issued at Rothesay and along the route.

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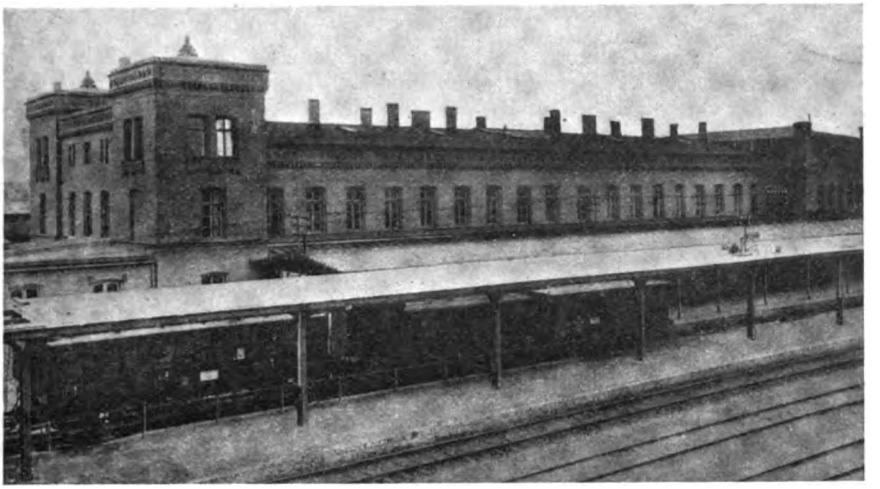

EYDTKUHNEN STATION, GERMAN SIDE (MODERNISED).

Leaves from the Log of a Locomotive Engineer [No. XVI.].

By ROBERT WEATHERBURN.

IT is strange how romance and tragedy will intrude themselves into the warp and weft of human affairs, however simply one may be circumstanced or remotely placed, as the following story will show.

I had just finished and seen the last of the splendid four-wheels coupled engines erected by us at the Prince Leuchtenberg Fabric workshops of the Novo Kalinken Most, St. Petersburg, leased to Beyer & Peacock and ourselves (they had the goods engines and we the passenger), when I received instructions to proceed at once to Eydtkuhnen, on the Polish Russian frontier, to examine and report as to the suitability of a disused old wooden shed (formerly utilised for storing flax) for the erection of fifteen heavy goods engines, built for the Moscow and Riazan Railway Company, to be sent by way of Pillau (which is really the deep water port for Königsberg). With little preparation beyond the luxury of a Russian bath, and hurriedly vised passport, I started from the Nicolai station on as bitterly cold a day as could befall one for such a journey. In due course I arrived at my destination, obtained lodgings at the Hotel de l'Europe, the only decent place, somewhat shabby looking but comfortable.

I met the representative of the "Ost Preussisch Eisenbahn" by appointment, and arranged for the tenancy of the old flax shed, the putting in of two temporary sets of rails, one of 4 ft. 8½ in. and the other 5 ft., the latter to connect up with the Russian gauge which terminated some little distance away from the shed. The heavy collys or pieces, after being unloaded at Pillau (which, by the way, was liable to be frozen up at any moment, as the winter was exceptionally severe), were to be placed on heavy girder trucks and forwarded to Eydtkuhnen; hence the necessity of the shed being fitted with the 4 ft. 8½ in. and 5 ft. gauges. As Pillau had never been made use of before for the reception and unloading of locomotives, it was needful to have someone to supervise the unloading of the various parts to prevent damage and delay as much as possible, as the delivery was much behind time. Hence a Mr. A—— was selected and sent out by the firm with instructions to report himself to me at Eydtkuhnen, and thence to proceed

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to Pillau, and there remain until the last cargo was received and dispatched; after that to join me at the workshops, and when finished there to accompany me to Riga to prepare for the opening of navigation.

Mr. A—— was a young gentleman of position and family, accustomed to the best of society, well mannered, a splendid athlete, passionately fond of all sports, possessed of a university education, and with a strong aversion to anything involving regular hours and systematic work, yet, unfortunately, like many others, had been put to a profession for which he had neither aptitude nor regard. Long afterwards I found out that it was a question of family policy that had brought about his appointment. I took him with me to Pillau, made all the necessary arrangements for men, machinery, and material for unloading, and on the arrival of the first steamer unshipped the many parts of the three locomotives, and after placing them on trucks consigned to Eydtkuhnen, followed them and left him in charge at the port.

Anyone familiar with the East Prussian State Railway station at Eydtkuhnen, must have been struck with the palatial character of the reception and waiting rooms, provided for imperial and royal persons, adjoining the wartesaal and dining rooms. As illustrious and distinguished persons were always more or less *en route*, the staff of waiters consisted of the very *élite* of that function, acting under the supervision of the chief contractor, one Herr M—, who, by the way, was an Italian, and although controlling and practically owning all the buffets on the O.P.R., found it policy to reside at Eydtkuhnen in order to do personal honour to any illustrious travellers who broke their journey there.

As I found it inconvenient and at times unpleasant to walk over the snow and not the best of roads to my hotel for dinner, I arranged with Herr M— to be dined *a la carte* at a fixed moderate sum. There, moreover, I had the opportunity of seeing the inrush of passengers from every part of the continent travelling to and fro, and staying for refreshments, and to examine luggage. This was an agreable break in the almost deadly monotony of my daily life. I had been some weeks a regular diner, when one day the manager of the buffet asked me to favour Herr M— with my company and to smoke a cigar. I readily complied, and was conducted into his sanctum, where I was formally introduced to his daughter, one of the most charming and accomplished young ladies it had been my pleasure to meet. Reports which I had previously heard had certainly not done full justice to her accomplishments and attractive person. I myself have heard her converse fluently in Russian, German, French, and Italian. She had a volume of Thackeray's in her hand, with the familiar colour and "imprimatur" of "Tauchnitz" on the covers, and she informed me that she was engaged in the pleasant task of learning English, which she could read with ease and interest; but as there was no opportunity in Eydtkuhnen of speaking English, she was desirous of extending her knowledge by conversation. Would I? Could I spare her a few minutes when convenient, say occasionally after dinner—assuring me, at the same time, that it should not place any interdict on my smoking—as she was sure that her pronunciation and knowledge of the idioms would be bettered. I agreed to do so whenever convenient, and the few opportunities afforded filled me with amazement at the marvellous aptitude displayed by this beautiful girl. Undoubtedly she was indebted to the circumstances of birth and position, her mother being French and her father Italian, and herself born in Poland, the land of polygots.

In one of the intervals that occurred between the arrival of the steamer which brought our locomotives to Pillau, Mr. A—— came over to consult with me. Always well dressed, that gentleman was singularly well endowed by nature and fortune with those characteristics which win favour from both sexes, yet a defective training had left him weak in principle, ill in keeping with his bright, winning face and ingenuous manner. Whilst discussing questions of business after dinner, he suddenly exclaimed "By Jove! I wonder who that handsome girl is who is coming in with Herr M—." I told him she was that gentleman's daughter. "Do you know her?" "Yes." "Then give me an introduction." This was formally done. After this I noticed his visits to Eydtkuhnen were more frequent than previously, and as a glut of work required my almost constant attention in the workshop or over the Russian frontier, where I found it inconvenient to dine, I only occasionally visited the station; but when I did so I found that Mr. A—— was eagerly inquired after, nay, had become a great favourite with the whole *personnel*. None could resist the influence of his easy bearing and prodigal treatment. There is always something in the make-up

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of an individual that strikes the eye or some other sense one of the most beautiful rings I ever saw was worn by Mr. A——, and I never dined with him without admiring its unique make. The stone carried his initials (intaglio), which he had frequently used when sealing letters addressed to me, so that I was familiar with the peculiar and effective blending of the letters, which formed a sort of monogram.

In time the work in so dreary and monotonous a place came to an end, when the last of the six-wheeled coupled engines for the Moscow and Riazan Railway crossed the frozen stream which constitutes the line of demarcation between the two countries *en route* to Moscow. We were not slow in packing up our "impedimenta" and booking to Riga, in Courland, where we had our own comfortable workshops empty and waiting for the summer consignments, which would commence with the disappearance of the ice, which I was glad to see showed signs of movement. All hands were busily employed in cleaning the machinery and preparing for the advent of the s.s. *Nero* with the first four locomotives in her hold. In the meantime I saw Mr. A—— off to Moscow, and on our parting noticed with surprise that our Adonis no longer wore his ring!

I always had a strange liking for Riga and the Baltic provinces, the conditions of life being much more agreeable than in any other town in Russia. I was fortunate to get hold of a fine lot of industrious men. It is astonishing how quickly the natives of the Baltic provinces pick up new duties and become handy men, and as Englishmen were liked, I had so many applicants that at length they became an annoyance. I instance one in particular on account of his persistence in meeting and saluting me at every turn to bring himself under notice. I repeatedly assured him that I had labourers enough, but it appeared of no use—he still "hung around." At last, thoroughly annoyed, I ordered him off the ground, and in doing so was struck by something so appealing in his manner and appearance that it caused me to put the question, "Are you a fitter?" feeling sure that he was not, and thus securing more vantage ground for denying him. "Nein Herr Ingenieur, I am a watchmaker!" "A watchmaker is no good to me." "Do give me a trial, sir, you will never repent it; I am hungering." My irritation was somewhat allayed and knowing that there was an obnoxious drain which threatened the health of the workmen, I intimated that if he thought proper he might clean that. I then hurried away to the quay, and in the press of business forgot all about it. The next day I found him at my side, and saluting me he said, "Herr Ingenieur, it is done; what is your further pleasure?" I never seriously thought, after the many refusals from the other workmen, that he would, single-handed, complete the augean task, and at once dispatched one of my English colleagues to report on the result. He soon returned and remarked that the place was no longer a nuisance, and that he could not for the life of him understand how so much work had been accomplished by one man in so short a time. Thus committed, yet somewhat gratified, I asked him his name. "Josef Wiertschewsky," he replied. "You are not a Rigenser, then?" "I am a Pollack, sir." I then engaged him conditionally at the usual rate of a rouble a day and placed him with one of the four Englishmen to assist in wheeling and erection.

Although a difficult man to please, the English chargehand in a few days reported that he had never seen the equal of Wiertschewsky for strength, willingness, and adaptation. Day by day he added to his reputation by showing more than ordinary mechanical skill for a man in his position. He united steadiness with a strength that was something marvellous. I refrain from instancing things done by him in the ordinary course, unostentatiously feeling sure they would not be credited. However, he endeared himself so much to the English charge hands by his willingness, devotion, and application, that in the course of time I appointed him to the position of head "begleiter," *i.e.*, to accompany the finished engines to the place of their destination, a duty much more onerous than appears on the surface, not alone on account of oiling the axles, but to prevent injury to the armature and pilfering at the hands of "Caramanjiks" (robbers) who infest the purlieus of railway stations and depôts. In this capacity, as in the preceding ones, he more than justified my selection and pay of 2½ roubles per day.

The year 1870 was remarkable for the Franco-German war, and in no part of Europe were German consular efforts more vigorous in calling in the widely scattered members of their army reserves than in Riga. It never entered into my head that Wiertschewsky, who was a native of Posen,

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was amenable to the far-reaching call of the Fatherland. It appeared that on his last return to Riga from Woronesh, where he had been delivering one of the locomotives, he found that the German consul had served him with a peremptory notice to join his "Militarisch Kreis" at Gumbinnen (Posen), which, owing to his absence, had not been acted upon as promptly as desired. This resulted in his arrest by the Russian police for extradition, after a desperate struggle, and his being placed at the disposal of the German consul. At his urgent request I was sent for, and found him much bruised and battered in resisting the seven Gardevois (police) who had apprehended him.

I was deeply grieved, not alone at his sorry plight, but also at the loss of so good and reliable a man. His grief was pitiable to behold. "Ach, Herr Chef, lieber meister, they have got me," he cried. "See what they have done." And the strong man, with with hair dishevelled, bloody face, and torn garments, was choked with emotion. "When I was hungering and tramped for months in search of work, nobody cared for me only to allow me passport to Russland, glad to be rid of me. Then you gave me work and food, and just when I had shed my rags and felt proud and thankful that I was a man . . . they drag me through the streets. Ach! I shall never have the chance again . . ." and his bare chest heaved with emotion.

I realised that no fine or importunity would help him, so I urged him to the utmost to be calm and make the best of it. "But, lieber meister, will you take me on again when the war is over and I am discharged?" he implored with manacled hands lifted most pitiably to his throat. "I give you my word, Wiertschewsky," said I, "so do not let that trouble you." . . . As preparations were being made to leave for the station, I hastily took out my purse with the intention of showing my sympathy in a more practical manner, when interpreting my action he said, "Nein! Nein! lieber Herr, I want no money, but if you will give me your address and allow me to write to you, you will be doing me a kindness." I took out my card with name and address printed in German and English as "Chef monteur," and at his request I put it into his waistcoat pocket and left him with tears running down his cheeks and shouting his adieus.

Months passed, and portents of winter were not wanting, and the bustle in the port was in proportion to the urgency of getting as much in and out as possible in the short time available. One late autumn morning, whilst turning over my letters just received, in order to pick out the most striking, I noticed one with a heavily blurred postal stamp—Metz—a name which had filled men's hearts and souls for many weary days with the keenest anxiety.

The address was:—

Herr R. Weatherburn,
Kitson & Co.,
Ingenieur (Chef Monteur) Fabrique,
Riga,
Russland.

The handwriting was that of a female, and I wondered who could be the writer, as I knew no one in that part of the world (until nearly three years later), and playing with my curiosity, as men unconsciously do, instead of opening the letter, I turned it over to look at the seal which I had felt.

The monogram of wax which stared me in the face was surely one, nay, the only one, for there could not be two alike with which I had been familiar. The initials, bold in curvature and outline, could be none other than those of Mr. A——. All further doubt was banished by the small flaw at the upper right corner. I opened the letter, taking care not to damage the impression, and read as follows:—

Feldzug Hospital,
Lager bei Metz.

Herr Chef Monteur W.

Sir,—I write this letter to you at the request of Trompeter Josef Wiertschewsky, of the Preussicher Festung Artillerie, who has been very bad wounded in the breast. He begs me to ask (sure) if he can have his employ again with you when he is well? He is so ill, and so anxious, that I would beg you to answer Yes. Should it arrive in time it will be a great contentment to a brave man. There is no hope for recovery.

Sister Catrina M—.

P.S.—The same one known to you at Eydtkuhnen.

For a time surprise and sincere commiseration filled my mind, but at last these gave place to wonder and conjecture. The seal, the handwriting, the imperfect English, the incomplete signature, and lastly the Post Scriptum. It is needless to say that so solemn a request was not disregarded by me. Yet no answer relieved my perplexities. For in those troublous times, with such gigantic issues at stake, this episode, however human, was but as a transient ripple on the tragic surface of affairs.

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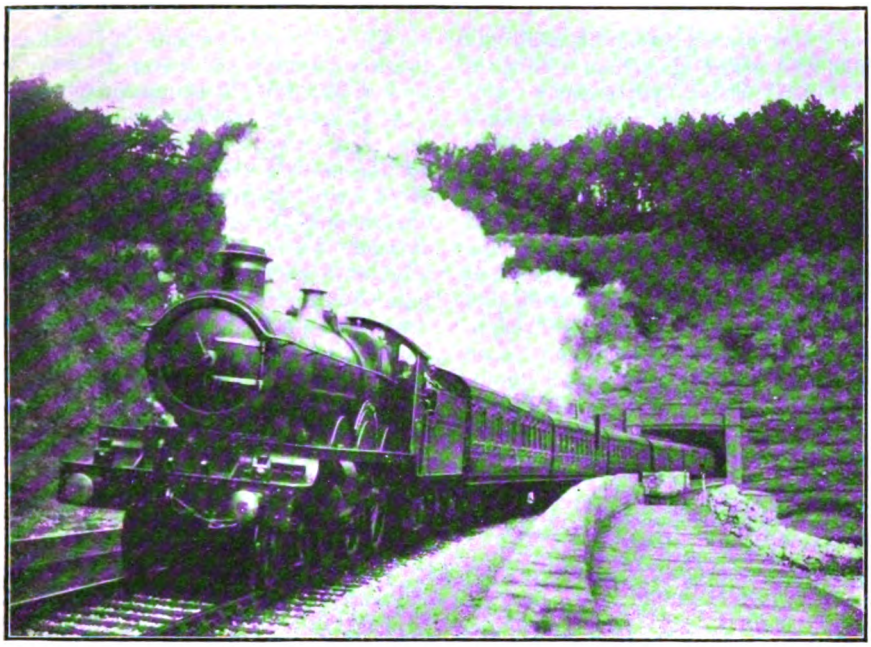

Photo] [*R. J. Purves.*

GREAT WESTERN RAILWAY:

Down Cornish Riviera express leaving Parsons Tunnel, near Dawlish.
Four cylinder 4–6–0 locomotive No. 4012, *Knight of the Thistle.*

British Locomotive Practice and Performance.

By CECIL J. ALLEN.

THE inaugural article of the New Year is one usually devoted to a review of locomotive practice and performance during the year just expired, but as my contribution next month will be concerned mainly with a retrospect of constructional practice during the last few years, it is my intention to devote the whole of the present article to the subject of performance during the year 1913. In one respect it will have a special character, in view of the fact that the runs dealt with are in the nature of "record" runs, the description of which, with considerable self-restraint, I have reserved until the present issue. In short, the runs that follow are the finest runs that I recorded during 1913, and certain of them are of a truly remarkable character.

In the first place, I have to describe an extraordinary run with the new 4-cylinder 4–6–0 engine No. 2222, *Sir Gilbert Claughton*, on the London and North Western Railway, which as a feat of hill-climbing—so far as my experience goes—stands absolutely unsurpassed. On more than one occasion in the past I have referred briefly to this trip, and have thereby in all probability aroused the curiosity of certain readers, but the whole of the space at my disposal would scarcely do justice to such phenomenal work. The correspondent who asked me some time ago what I should do for superlatives when recording the performance of the "Claughton" class had, it now appears, very good grounds for his question! In order to render the description as complete as possible, I have prepared a diagram showing graphically the speed throughout the journey, plotted over the gradient profile, and also a table giving the mile-post times throughout, together with those of the previous best recorded modern run over the same route. Before going further, I must make this

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confession: for once I broke through my usual rule, and asked the driver—Ford, of Crewe, under whose particularly able management the run was made—to afford me an opportunity of recording what the new "giant" really could "do" uphill.

The train was the 6.40 p.m. *ex*-Preston, consisting of portions from Liverpool and Manchester for Edinburgh and Glasgow, and also the through coaches for Aberdeen and Whitehaven off the 2 p.m. *ex*-Euston, and it may be as well to give the times throughout, although the chief interest centred in the climb from Oxenholme to Shap summit. From Preston we had a load of ten 8-wheelers and two 12-wheelers, totalling 52 axles and weighing 365 tons in all, and very

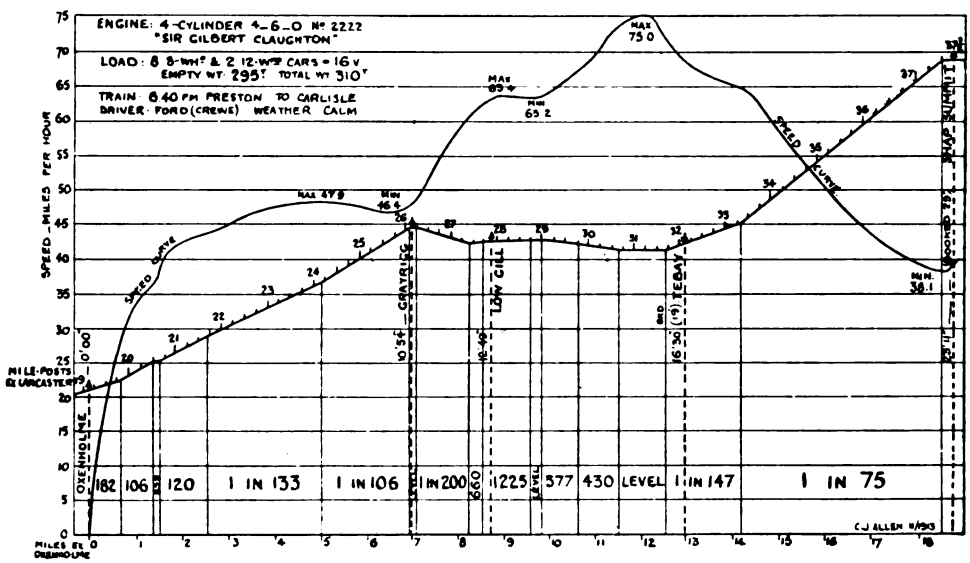

DIAGRAM SHOWING PERFORMANCE OF LONDON AND NORTH WESTERN LOCOMOTIVE NO. 2222, *Sir Gilbert Claughton*, BETWEEN OXENHOLME AND SHAP SUMMIT.

good work was done to Carnforth, but not exceptional, according to present London and North Western standards. Despite the brief rise at 1 in 95 at the start, and the succeeding adverse miles at 1 in 500, Barton, 4¾ miles, was passed in 7 min. 50 sec., and a speed of 68·1 miles per hour was attained at Brock troughs. Along the slightly adverse grades to Galgate, speed was maintained at from 63·8 to 65·2 miles per hour, the 8 miles from Barton to Scorton taking 7 min. 25 sec., and the 8¼ miles thence to Lancaster 7 min. 55 sec., the latter point being passed in 23 min. 10 sec. from Preston (21 miles). With a further maximum of 71·4 miles per hour at Hest Bank, Carnforth was reached in 6 min. 20 sec. from Lancaster—a distance of 6¼ miles—the whole 27¼ miles from Preston having been covered in the smart time of 29½ min., or 1½ min. under schedule.

At Carnforth the Furness line portion of the train—two 8-wheelers—was detached, leaving us with the not inconsiderable load of 44 axles, or 310 tons, to go forward to Carlisle, and Driver Ford gave us a foretaste of what was to follow on the succeeding short run to Oxenholme, with its tight 17-min. booking. The start from Carnforth consists of ¾-mile down at 1 in 300, on which a speed of all but 40 miles per hour was developed; then follow 2⅜ adverse miles at 1 in 131 on which the speed rose further to 47·4 miles per hour, and it was still rising when we breasted the summit. Consequently, Burton, 4½ miles from Carnforth, was passed in 6 min. 50 sec.—the best time I have yet seen recorded. From the summit there is a slight fall of just over a mile at 1 in 280, followed by 2 miles of level—a short "breathing space" before commencing the ascent of Grayrigg bank—on this we attained a top speed of 65·2 miles per hour, passing Milnthorpe, 2¾ miles from Burton, in a further 2 min. 40 sec. Now came a wonderful feat: after climbing 2½ miles at 1 in 173, 1 at 183, ½ at 440, 1 at 109, and about ¾ at 182—5¾ miles steeply adverse—the speed had only fallen to 51·1 miles per hour when we shut off steam for the stop! Thus our start-to-stop time for the 12⅞ miles from Carnforth to Oxenholme, including 8½ miles

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of steep up-grades, was only 16 min. (dead), a clear gain of 1 min. on a booking of 17 min., which on some other lines might well be considered a "counsel of perfection" under similar circumstances.

But it is the climb from Oxenholme to Shap summit that, as our American friends would say, "licks creation." The run with which it is compared in the table was one very carefully timed by a personal friend, of which brief details were given in the July, 1913, issue of the RAILWAY MAGAZINE, and *Sunbeam* to say that on the occasion of the former run heavy rain was falling all the time, whereas the 4–6–0 engine enjoyed calm weather. I may add that my friend's maxima and minima were only read with an ordinary watch, and may not, therefore, be absolutely accurate; my own readings were made, as usual, by stop-watch, independent of the mile-post readings shown, which were taken as a check at every half-mile from Oxenholme to the summit.

The start was brilliant, speed rising to

		Engine No.	2222, *Sir G. Claughton*		2062, *Sunbeam*	
		Type (superheater)	4-cylinder 4–6–0		2-cylinder 4–4–0	
		Load (axles)	44		37	
		Load (tons)	310		265	
Mile-posts.	Miles from start.	Stations.	Bkd. Time.	Actual Times.	Max. & Min. Speeds.	Actual Times.	Max. & Min. Speeds.
			Min.	Min. sec.	Miles pr. hr.	Min. sec.	Miles pr. hr.
—	—	OXENHOLME .. dep.	0	0.00	*	0.00	
19½	⅜	Mile-post .. .. pass	—	1.33	21·5	1.44	
20	⅝	,, ... ,,	—	2.34	31·5	2.47	
21	1⅞	,, ... ,,	—	4.12	41·7	4.28	
22	2⅛	,, ... ,,	—	5.35	44·2	5.55	
23	3⅜	,, ... ,,	—	6.55	46·9	7.13	49·0
24	4⅝	,, ...†† ,,	—	8.11	47·9	8.29	
25	5⅞	,, ... ,,	—	9.27	47·4	9.46	
26	6⅛	,, ...¶ ,,	—	10.44	46·4‡	11.10	42·9
—	7	GRAYRIGG .. .. ,,	—	10.54		11.23	
27	7⅜	Mile-post .. .. ,,	—	11.54		12.26	
—	8¼	LOW GILL .. .. ,,	—	12.46		13.21	
28	8⅝	Mile-post .. .. ,,	—	12.53	63·4	13.28	
29	9⅞	,, ... ,,	—	13.50	63·2	14.26	
30	10⅛	,, ... ,,	—	14.44	66·7	15.21	
31	11⅞	,, ... † ,,	—	15.33	75·0	16.15	66·7
32	12⅛	,, ...‖ ,,	—	16.24	69·2	17.10	
—	13	TEBAY .. .. ,,	18	16.30		17.17	
33	13⅜	Mile-post .. ..§ ,,	—	17.18	65·2	18.08	
34	14⅝	,, ... ,,	—	18.14	60·0	19.07	
35	15⅞	,, ... ,,	—	19.20	51·7	20.22	
36	16⅛	,, ... ,,	—	20.38	44·6	21.52	
37	17⅜	,, ... ,,	—	22.02	40·2	23.26	
37¼	18⅛	,, ..‡‡ ,,	—	22.49	38·1	24.23	27·3
37½	18⅜	SHAP SUMMIT .. ,,	28	23.11		24.46	

* Chronograph readings.
† Water-troughs begin.
†† End of 1 in 133 up.
¶ End of 1 in 106 up.
‖ Beginning of 1 in 147 up.
§ End of 1 in 147 up.
‡‡ End of 1 in 75 up.
‡ From 25½ to 25¾ mile-posts.

this was the fastest climb of which I had previously seen a detailed timing. In the latter instance the train was the 1.38 p.m. from Preston to Glasgow, which stops at Oxenholme on Saturdays to detach a portion for Windermere, and the engine was one of the "Precursor" type—No. 2062, *Sunbeam*—to which a superheater has been fitted, with a load of 37 axles, or 265 tons. With a load 18 per cent. heavier, therefore, *Sir Gilbert Claughton* showed superior work throughout, although it is only fair to 26·5 miles per hour on the ¾-mile at 1 in 182, and further to 35·7 on the 106. To commence with, 1⅜ miles from the start, on grades of 1 in 182 and 106, in 3 min. 26 sec. would want beating, with 310 tons behind the tender! The tiny strip at 1 in 859 helped the acceleration, as will be seen in the diagram, and at the end of the 1 in 120 we were travelling at a fraction over 43 miles per hour, and still accelerating. Finally a maximum speed of 47·9 miles per hour was reached on the 1 in 133, the 47⅞ miles from

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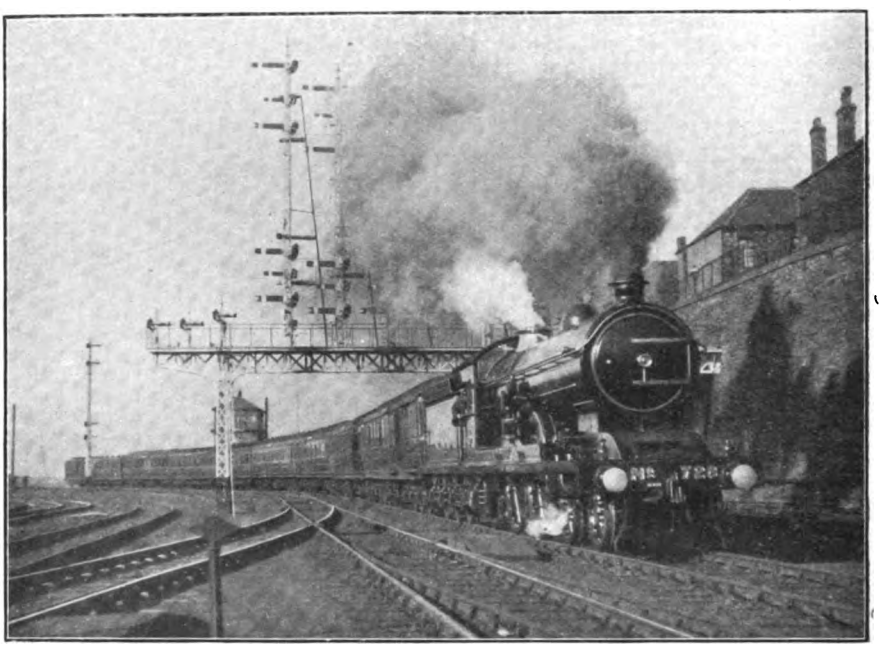
the start to the 24 mile-post having taken 8 min. 11 sec. On my friend's run with *Sunbeam* it seems that a slightly higher speed was attained on the 133, at about the 22¾ mile-post, which he calculated at a maximum of 49 miles per hour, after which the speed settled down to a steady 47·4 up to the commencement of the 1 in 106. In any case, even if 49 was not quite touched, his time between mile-posts 22 to 23 is 2 sec. faster than mine. On the final 1 in 106, however, the six-coupled engine very nearly maintained the same high speed, there being just a temporary fall after 1½ miles to an absolute minimum of 46·4 miles per hour, beyond which it will be noticed that a slight increase of speed had taken place before the summit was actually "topped." The speed of the four-coupled engine on this length fell to a minimum of 42·9 miles per hour. To Grayrigg, therefore, up 7 miles of really difficult grades from a dead start, *Sir Gilbert Claughton* had, with 310 tons' load, run in 10 min. 44 sec., against *Sunbeam's* but little less brilliant time of 11 min. 23 sec. with 265 tons, or the previously recorded times of 12 min. 2 sec. and 12 min. 45 sec. with *Cyprus*, a superheater 4–4–0 of the "George the Fifth" type, hauling 280 and 305 tons respectively.

As will be seen by the profile, the Grayrigg-Tebay stretch is but little easier than level, but here the great accelerative powers of the new engine were equally in evidence. The brief mile at 1 in 200 down alone raised the speed to over the mile-a-minute rate, and while on the slightly adverse grade beyond it remained steady at 63·2 to 63·4 miles per hour, the succeeding 1½ miles down at 1 in 577 and 430 produced the truly startling maximum speed of 75 miles per hour! And this at Tebay, going North!! It will be noticed that the rate on the level fell appreciably before the 1 in 147 was entered upon, but this was due to the resistance from the water troughs, which are situated near the 31½ mile-post, and at which water was taken. The time of 5 min. 36 sec. for the 6 miles from Grayrigg to Tebay was one I have never seen touched, while the total of 16 min. 30 sec. for the 13 miles from Oxenholme start showed a gain of 1½ min. on the very "tight" 18-min. schedule to this point. *Sunbeam's* time of 5 min. 56 sec. from Grayrigg to Tebay was also remarkably fine, and the total on the latter run of 17



Photo] [*R. J. Purves.*

NORTH EASTERN RAILWAY:

2.20 p.m. Edinburgh–King's Cross Dining Car express passing King Edward Bridge Junction, Newcastle-on-Tyne. Three-cylinder 4–4–2 locomotive, No. 728 (Schmidt superheater).

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Photo] [*R. Hall.*

GREAT NORTHERN RAILWAY:

4–4–0 locomotive, No. 1072 (rebuilt with larger boiler), running through Hitchin station.

min. 17 sec. from Oxenholme was but little inferior to the 16½ min. of *Sir Gilbert Claughton*, considering the relative size of the two engines.

Most remarkable of all, however, was the final "pull" to Shap summit. The short rise at 1 in 147 past Tebay brought the speed of No. 2222 down to 65·2 miles per hour, but a continuance of the same grade, by the appearance of the curve, would not have had much further effect. On the 1 in 75 proper, which is 4 miles in length, a steady fall in speed was registered, rapid at first, but greatly reduced near the summit, the absolute minimum at the 37½ mile-post, which marks the exact conclusion of the grade, being 38·1 miles per hour. The 40-mile rate was thus maintained until the last ½-mile, and I am of opinion that the engine could have sustained a rate of well over 35 miles per hour on the 1 in 75, had the grade been further prolonged, judging

Photo] [*H. T. Worlock.*

LONDON AND NORTH WESTERN RAILWAY:

Up Shrewsbury express, near Watford. 4–4–2 tank engine No. 834.

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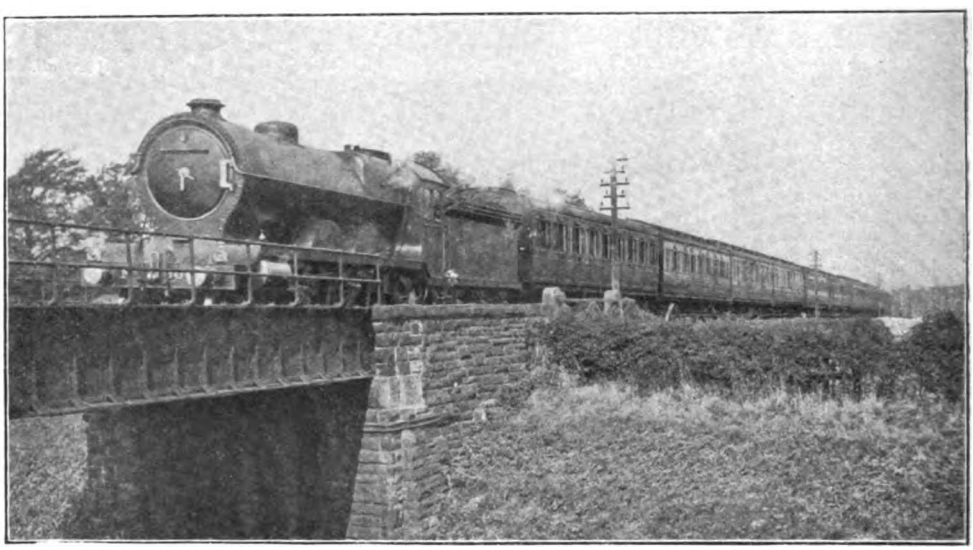
by the appearance of the speed curve at this point. In any case, however, the time of 6 min. 41 sec. for the 5⅝ miles from Tebay to the Summit Box—in itself 3 min. 19 sec. under schedule time—was an epoch-making performance. The speed of *Sunbeam* fell more rapidly on the final climb to a minimum of 27·3 miles per hour at the summit, but the time of 7 min 29 sec. in the latter case was also a record, second only to that of *Sir Gilbert Claughton*, and the rapid fall of speed near the top in *Sunbeam's* case might be attributed in part to the bad weather and the wet state of the rails. The conclusion of the 4–6–0 engine's run to Penrith calls for no comment, and, as we were now nearly 5 min. ahead of time, no fast running was made on the falling grades, the actual time of 14 min. 58 sec. for the 13½ miles from the Summit Box to the stop at Penrith being exactly in accordance with the easy schedule between these points, so that even then our arrival was all but 5 min. early.

To sum up as regards the climb, however, we had completed the ascent of 18⅝ miles from Oxenholme to Shap summit in the astonishing time of 23 min. 11 sec., 4 min. 49 sec. under schedule time, and 2 min. 49 sec. faster than the fastest booked time from *passing* Oxenholme to the Summit Box. It must be remembered, also, that these are by no means easy up hill times, but, on the contrary, decidedly difficult, as is the custom with working times, the working book erring on the side of difficulty uphill and undue sloth downhill. Consequently, the merit of the achievement is in this way considerably enhanced. The average speed from the start at Oxenholme to passing Shap summit, during which distance there is a change of level of well over 600 ft., works out at 48·2 miles per hour, and the insertion of this uphill portion into the times of previous excellent runs would give an easily possible time of 93 min. for the 90 miles from Preston to Carlisle, against the 104 min. allowed the famous 2 p.m. *ex*-Euston with a load but little greater for many months in the year. The average to the summit of 45·1 miles per hour in the case of *Sunbeam* is hardly any less meritorious, when all the running factors are duly considered. Mr. Bowen Cooke and the Crewe staff in general have every reason to be proud of these latest Crewe productions, and Driver Ford, with his fireman, Bergin, may equally be congratulated on such a magnificent achievement.

The second of my runs is also, curiously enough, an example of the work of a 4-cylinder 4–6–0 superheater locomotive, but in this case the running difficulty lay more in the vastness of the load than in the steepness of the grades. It is a matter by no means easy to decide which was the finer run of the two, so I will not attempt



Photo] [*F. E. Mackay*

NORTH BRITISH RAILWAY:

Edinburgh–St. Pancras express. 4–6–0 locomotive No. 890, *Holyrood.*

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Photo] [*F. E. Mckay.*

CALEDONIAN RAILWAY:

10 a.m. Glasgow–Euston express. 4–6–0 locomotive No. 907 (Schmidt superheater).

to do so, but readers will not be surprised when I say that the rival run was made on the Great Western Railway; it was from Exeter to London on the 3.27 p.m. summer express, which is booked to call at Taunton, and run from thence to London, 143 miles, in 154 min. The date being a Saturday in late August, every train was running in two or more portions, and up trains in particular were crammed with passengers and luggage. Indeed, when this train arrived at Exeter, despite its load of thirteen 8-wheelers, of which no less than eleven were of the heavy 70 ft. stock, there were barely a dozen seats to be found, and it became imperative to attach an extra coach—an old non-corridor 8-wheeler—which was completely filled with Exeter passengers. Our load consisted, therefore, of 56 axles; the weight empty totalled 446 tons, and inclusive of passengers and luggage, fully 490 tons. There was some talk on the platform of furnishing a pilot to Whiteball, but in the end we left unassisted, hauled by the 4-cylinder 4–6–0 engine No. 4030, *King Harold*. To complete the account, I give details of the run to Taunton, but the interest lies chiefly in the Taunton-Paddington section of the journey.

From Exeter the line rises almost without a break to Whiteball summit, but for the first 13 miles the grades are not very severe, not exceeding a maximum steepness of 1 in 207, and ranging mostly round 1 in 330 or 340. Stoke Canon, 3½ miles, was passed in 7¼ min., and the 9¼ miles thence to Collumpton took 11 min. 35 sec. At this point we had attained a speed of 51·1 miles per hour against the grade, and 1¾ adverse miles at 1 in 154 beyond to Tiverton Junction only reduced this rate to 49 miles per hour. To the summit there is a final rise of 4¾ miles, the last 2¼ at 1 in 115, and on this grade the speed fell finally to 31 miles per hour, the 7¼ miles from Collumpton having taken 10 min. 50 sec. and the 20 miles from Exeter 29 min. 40 sec. Descending the Wellington bank, the speed quickly reached a maximum of 77·5 miles per hour, but immediately beyond Wellington we were badly checked for underline bridge repairs, so that the 10¾ miles from the summit to the stop at Taunton took 12 min. 50 sec. The 30¾ miles from Exeter to Taunton had thus taken 42½ min. or 39½ min. net—a loss of 2½ min. net on schedule, but no mean achievement with this load. It was evident on arrival at Taunton that the Minehead and Ilfracombe portions of the train had been sent on in advance, but, as if we had not already enough rolling stock on our train, another 8-wheeler was added, bringing our axle-load to 60 axles (71 axles by Great Western reckoning, which counts a 70-ft. coach as having 10 wheels). 473 tons empty, and fully

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520 tons with "passengers, luggage, staff and stores." It was too much to expect that time would be kept with so vast a load!

After station delays, we left Taunton exactly half-an-hour behind time, making a wonderful start—so much so, indeed, that until I caught sight of the head of the train round a curve, I thought we must be piloted. Cogload Junction, 4¾ miles, was passed in 7 min. 55 sec. at a speed of 51·1 miles per hour, which shortly afterwards increased to a sustained 63·4 on the level beyond Athelney. At Somerton a minimum speed of 48·4 miles per hour was registered, and near Castle Cary we were again doing 61·6. Thus the 12½ miles from Cogload to Somerton took 13 min. 10 sec., and the 10¼ miles thence to Castle Cary 11¼ min.—a total of 32 min. 20 sec. for the first 27½ miles. Now came the "pull" to the summit which is known as "mile-post 122¾," and is the only such post in existence, I suppose, that is dignified by working times; on the west side this is a climb of 6¼ miles, broken by a number of short strips of level, but of which over three are inclined at from 1 in 79 to 1 in 98. The last 3 miles are especially stiff, being inclined at 1 in 93, 98 and 81, with short breaks of level and easier grades aggregating 1 mile. Yet at the summit of the 1 in 81, with 520 tons, our minimum speed was actually above 30 miles per hour—to be exact, 30·4. The 7 miles from Castle Cary to mile-post 122¾ had taken only 9 min. 20 sec., and the 34½ miles from the start 41 min. 40 sec.

Good use was made of the descending grades to Frome, where the usual careful slack was made, and also of the descent thence to Westbury, where we slacked again. On the former bank we touched 68·1 and on the latter 67 miles per hour, taking 7 min. 40 sec. for the 7¼ miles from the summit to Frome, and 7 min. for the 5¾ miles thence to Westbury. We had now taken 56 min. 20 sec. from Taunton—47½ miles of none too easy road. By far the finest work of the journey was to come, however, and the feat now to be described was simply extraordinary with so great a load. From Westbury past Edington to near Lavington the line is almost level for nearly 8 miles, with a slightly rising tendency; then it rises for 5¾ miles at 1 in 222. This is followed by 3¼ miles level and rising at 1 in 400 and 500, and a further mile up at 1 in 225, after which there is a slight fall for 1¼ miles at 1 in 380 and 300. The final climb to Savernake is one of 6 miles, commencing for 2 miles at 1 in 200 to 270, then broken by a mile practically level, and finishing with 2 miles at 1 in 240, ¼-mile level, and ¾-mile at 1 in 153. Yet on the initial level stretch from Westbury the mile-a-minute rate was just attained, and maintained for ¾-mile; on the long 1 in 222 ascent to Patney the minimum speed was a sustained 45 miles per hour; the flatter ascent past Woodborough and the short descent near Pewsey raised the rate to 59·2 miles per hour; and our final minimum on the 1 in 153 at Savernake, after 18 miles

Photo] [*J. B. Sherlock.*

CALEDONIAN RAILWAY:

9.45 a.m. Glasgow train leaving Oban station. 4–6–0 locomotive No. 52.

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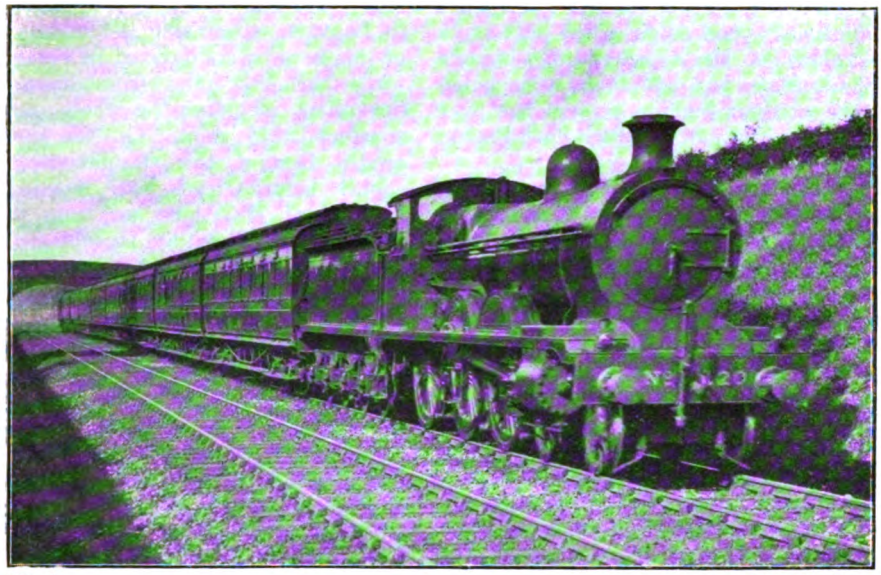

Photo] [*F. E. Mackay.*

GLASGOW AND SOUTH WESTERN RAILWAY:
11 a.m. Glasgow–St. Pancras express. 4–6–0 locomotive No. 120.

of almost unbroken grades, was 47·9 miles per hour! The actual times were: from Westbury to Lavington, 8½ miles, 10 min. 5 sec.; from Lavington to Patney, 5¾ miles, 7 min. 20 sec.; from Patney to Pewsey, 6 miles, 6 min. 35 sec.; and from Pewsey to Savernake, 5 miles, 6 min. 5 sec. From Lavington to Savernake the 16¾ uphill miles had taken exactly 20 min., *at an average speed of no less than* 50·3 *miles per hour*—surely a marvellous tribute to the powers of the locomotive with 520 tons behind the tender. The 72¾ miles from Taunton to Savernake had taken in all 86 min. 25 sec.

Now came the long and welcome descent to Reading, which was covered at a good speed, considering its gradual character. Past Bedwyn we were doing 71·4 miles per hour, and at Hungerford 73·8; thence to Newbury the speed ranged between 71·4 and 73·8, falling afterwards gradually to 70·3 at Thatcham, 68·1 at Aldermaston, and 67 at Theale. The 8¾ miles from Savernake to Hungerford took 7 min. 50 sec.; the 8½ miles thence to Newbury occupied 7¼ min.; and the 11¾ miles from Newbury to Theale were reeled off in 10 min. 25 sec. Thus we had covered the 101¾ miles from Taunton to Theale in 111 min. 55 sec., and there was now actually a faint prospect of keeping time, which I had barely dreamed that we should do when we left Taunton. But signals, alas! effectually disposed of the possibility. A long check near Reading West was succeeded by a severe one outside the main station, and, in consequence, the 5¼ miles from Theale to Reading took 7 min. 25 sec., and we passed the latter point at a much lower rate than usual. Despite this check, *King Harold* picked up most gamely, and on a practically level road accelerated to 57·7 miles per hour at Twyford, speed rising thence along the almost imperceptible fall at 1 in 1320 to 62·5 at Maidenhead, 64·3 at Taplow, and actually to 67 miles per hour at Slough. At Southall, after some miles of the same fractional grade, in this case adverse, the rate had fallen again to 62·5 miles per hour, after which there was a pronounced "easing up." The 5 miles from Reading to Twyford took 6¼ min.; the 6¾ miles thence to Maidenhead occupied 6 min. 35 sec.; the 5¾ miles on to Slough were covered in 5 min. 20 sec.; and the 9½ miles from Slough to Southall consumed 9 min. 5 sec., making a total of exactly 21 min. for the 22 miles from Twyford. From Southall to Acton the 4¾ miles took 4 min. 55 sec., so that the 138¾ miles from the start had been covered in 151½ min., or 149 min. net. Once again signal checks intervened, causing the last 4¼ miles to take 8 min. 50 sec., and giving a total time of 160 min. 20 sec. for the run, but I am very much inclined to think that, unchecked, we might have just—only just—have reached Paddington in

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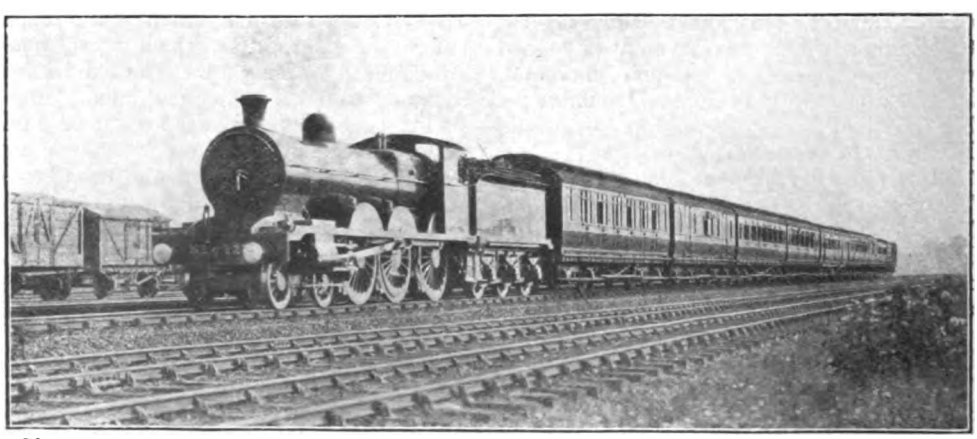
the allotted 154 min. In common with most readers I have read much in the past as to the exploits of Mr. Churchward's famous 4–6–0 engines, but no such remarkable evidence of their hauling powers has ever come under my own observation until I made this wonderful run.

By way of comparison with these efforts, I wish to give some details of a run which I enjoyed during the past summer on the Northern Railway of France, which affords an interesting comparison with the foregoing from the hill-climbing standpoint. The train was the 8.25 a.m. Boulogne boat express *ex*-Paris (Nord), and the load a heavy one of ten 8-wheelers and four long 4-wheeled vans, weighing empty 373 tons, and with passengers and luggage at least 405 tons, as the train was very full. At the head of the train was one of the latest 4–6–2 de Glehn compound engines, fitted with superheater, a type which, although by no means the largest of the "Pacific" types in France, is uncommonly powerful. The start from Paris is downhill for 2 miles at 1 in 250, after which follow 3½ miles of undulating grades. On this initial stretch we attained a speed of well over a mile-a-minute, passing St. Denis, 3¾ miles, in 6 min. 5 sec., and Pierrefitte, 6¼ miles, in 8½ min. Then followed the well-known Survilliers bank, corresponding somewhat to the Potters Bar bank of our English Great Northern Railway; the grade is the same, being 1 in 200, but much longer in the former case, as it extends for some 11¼ miles in all. Yet up this we rushed at a speed which never fell below an absolute minimum of 54·2 miles per hour, and mainly fluctuated between 56·3 and 57·7 miles per hour. Indeed, the 8½ miles from Pierrefitte to Louvres, comprising the middle portion of this bank, were covered in 9 min. 5 sec., while the 18½ miles from Paris out to Survilliers, including the whole climb, only consumed 21¾ min. On the descending grades beyond the summit we slacked slightly before Orry-la-Ville, but maintained a speed of 77·5 miles per hour for some distance after Chantilly, thereby slightly exceeding the legal limit of 74½ miles per hour. Generally speaking, however, the speed was moderate, and we passed Creil, 31¾ miles from Paris, in 33 min. 50 sec., at the usual speed of 50 miles per hour.

For some 20 miles the line now rises gradually, the gradients at first averaging 1 in 500, but for the last 6 miles about 1 in 300. In addition to this, we encountered a bad permanent way check about 5 miles beyond Creil, so that the 18 miles from Creil to St. Just took 22 min. 10 sec. An excellent speed was maintained on the falling grades beyond; the 8¾ miles from St. Just to Breteuil were covered in 9 min. 10 sec., and a rate scarcely varying a fraction from 75 miles per hour was then maintained for quite 15 miles. In fact, the 17 miles from Breteuil to Boves were covered in exactly 14 min.; between the latter station and Longeau the speed was "eased" considerably, this 2½ miles occupying 2¼ min., and giving a total of 81 min. 25 sec. for the 78½ miles from Paris; and finally came a severe permanent way check before we passed Amiens at the usual 25 miles per hour. Our time for the initial 81 miles from Paris was 85¼ min., or not more than 82 min. net. Recovering quickly on the level



Photo] [*F. E. Mackay.*

GLASGOW AND SOUTH WESTERN RAILWAY:
St. Pancras–Glasgow express. 4–6–0 locomotive No. 127.

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stretch beyond, a speed of from 68·1 to 69·2 miles per hour was rapidly attained, and maintained continuously on the level, the 9¼ miles from Amiens to Picquigny taking 10 min. 20 sec., the 13¾ miles thence to Pont Remy 12½ min., and the 5½ miles to a stop at Abbeville, 5¾ min. Here water is taken and the train examined, the stop being for working purposes only. We had reached this point, 109½ miles from Paris, in 113 min. 50 sec., or in the remarkable net time of 110½ min., allowing for the two permanent way checks.

Starting again after a stop of 3 min. 35 sec., we soon "got going," as, indeed, was necessary, with only just over 52½ min. remaining for the 48½ miles to Boulogne Ville. Rue, 14¼ miles, was passed in 17 min. 40 sec., and Rang-du-Fleurs-Verton, 24¾ miles, in 26 min. 10 sec., but, most unfortunately, we were pulled up at Etaples by signal, and stood there for exactly 3½ min., having covered the 31¾ miles from Abbeville in 34 min. 10 sec., start-to-stop. We could not have stopped in a worse place, as the train had now to face the Dannes-Camiers bank of 8 miles, mostly at 1 in 133 and 143. Neufchatel, 8¼ miles from Etaples, was passed in 11 min. 20 sec.—a remarkable start, this, with 405 tons—and speed then ranged high down the Hesdigneul bank, a maximum of 77·5 miles per hour being again touched. The 8½ miles from Neufchatel to the Boulogne stop were actually covered in 8 min. 10 sec., so that we had run from Etaples, 16¾ miles, in 19½ min. start-to-stop. From Abbeville we had, therefore, taken 57 min. 10 sec. gross for the 48½ miles; 53 min. 40 sec. actual running time; and certainly not more than 50 min. net, which meant that the total net time for the 158 miles from Paris, including Abbeville stop, was only 163½ min., or 6½ min. under that scheduled. Considering the difficult character of portions of the road, as regards grading, and the slacks at Creil and Amiens, this wonderful work, which I believe represents nothing very unusual so far as the Nord Company is concerned, fully bears comparison with the English London and North Western and Great Western runs already described.

In conclusion, as this issue partakes somewhat of the character of a special Scottish number, I am giving details of a couple of runs north of the Border which I was enabled to make last summer by the courtesy of Mr. D. A. Mathieson, General Manager of the Caledonian Railway. Although perhaps the performance was not altogether of the same exceptional character as that of the preceding runs, which were "record" trips in every sense of the word, yet some notable work was done. The first trip was made on the 8.5 p.m. express *ex*-Euston, as from Carlisle onwards. This train, as may be known, is mainly composed of a heavy Oban portion, the major part of the Aberdeen traffic being conveyed by the relieving 8 p.m. train. On the night in question the load was particularly heavy, consisting as it did of two 12-wheeled sleeping cars, three composite 8-wheeled sleeping cars and third-class coaches, and eight further 8-wheelers, totalling 56 axles and weighing fully 400 tons in all. The train engine was No. 120, one of the latest 4–4–0 superheaters—a type of whose work I have been anxious for some time to secure a record—and, as is customary with so heavy a train, a pilot of the intermediate enlarged "Dunalastair" type, No. 896, was provided to Beattock summit.

We got away in great style, passing Rockcliffe, 4⅛ miles, in 6½ min., attaining 69·2 miles per hour before Gretna, and passing that station, 8⅝ miles from Carlisle, in 10¾ min. from the start. Up both the long stretches of 1 in 200—the 7¼ miles past Kirkpatrick and the 4¼ miles past Ecclefechan—a minimum speed of 52·3 miles per hour was sustained, the intermediate mile down at the same inclination to Kirtlebridge and the subsequent two level miles producing a maximum speed of 63·4 miles per hour. So the 8⅛ miles from Gretna to Kirtlebridge only took us 9 min., and the 9 miles thence to Lockerbie 9 min. 5 sec., giving a total of 28 min. 50 sec. for the 25¾ miles to this point. Good use was made of the falling grades past Lockerbie—1⅞ miles at 1 in 200, and 3⅞ at 1 in 528—on which a maximum speed of 73·8 miles per hour was reached and maintained for some distance, and the 8¾ miles from Lockerbie to Wamphray were covered in the fine time of 7 min. 40 sec. Beattock station, 39¾ miles from Carlisle, was passed in 41 min. 40 sec.—quite a "racing" time this—the first 4 miles of Beattock bank averaging 1 in 200, having only reduced our speed to 55·6 miles per hour. A magnificent ascent of the steeper part of the incline was made, and the 10 miles from the station to the summit, with their continuous average grade at 1 in 75 to 1 in 88, only took 18 min. 25 sec. to a dead stand at the summit box, speed not falling below 31·3 miles per hour at the steepest point. Consequently the 49¾ miles

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from Carlisle, with a clear change in level of all but 1,000 ft., had been covered start-to-stop in 60 min. 5 sec.— a very fine achievement with such a load, even though two engines were employed.

The summit stop lasted 4 min. 5 sec.—a somewhat unnecessarily long period, it seemed to me, with nothing more to be done than to detach the pilot and take water—and No. 120 then set out to haul the 400-ton train-load on to Stirling. Elvanfoot, 2⅞ miles, was passed in 4 min. 55 sec., and the 10⅝ miles thence down to Lamington occupied 9 min. 50 sec., speed mostly ranging from 68·1 to 70·3 miles per hour. On the 2¾ miles up beyond the Clyde bridge (2 at 1 in 200) speed fell to 54·2 miles per hour, rising again, however, to 71·4 miles per hour on the sharp descent beyond Symington. The 3⅝ miles from Lamington to Symington took 3¾ min., and the 6⅝ miles thence to Carstairs, where we slacked carefully, 6 min. 40 sec., giving a total time of 25 min. 10 sec. for the 23¾ miles from the summit start. A speed of all but 45 miles per hour was attained on the 4¾ rising miles to Craigenhill summit (1 in 440 and 200), and a maximum of 68·1 was then touched before we passed Law Junction, cautiously as is usual, in 12¾ min. from Carstairs (10½ miles). Before Holytown a maximum of 67 miles per hour was again touched, but a slight check for the junction was succeeded by a very severe one for signals outside Mossend; thus, although the 5⅞ miles from Law Junction to Holytown had been covered in 6 min. 10 sec., the succeeding 4⅜ miles to Coatbridge took 7 min. 5 sec. At this point the engine accelerated easily to 52·3 miles per hour on a gradually rising grade, covering the 6½ miles from Coatbridge to Cumbernauld in 7¼ min. The long descent to Larbert was now run at a most moderate speed, not averaging over 60 miles per hour; with a decided slack through Larbert Junction the 9 miles from Cumbernauld took 9 min. 40 sec. The 1½ adverse miles at 1 in 126 from Alloa Junction up to Plean Junction reduced the speed from 61·8 to 46·4 miles per hour, and we then descended rapidly into Stirling, having covered the 8 miles from Larbert, despite a severe signal check just prior to the stop, in 10 min. 20 sec.

Photo] [*J. G. Irving.*

CALEDONIAN RAILWAY:

10 a.m. Down West Coast Express near Kirkpatrick.
4–4–0 locomotive, No. 145.

We had, therefore, run from Beattock summit, 68 miles, in 78 min. 25 sec., or about 75 min. net, and the whole 117¾ miles from Carlisle, with their many running difficulties, had been completed in 25 sec. under the booked time of 143 min. Allowing for a stop of the customary 2 min. duration at the summit box, and for the two checks, we had covered the 117¾ miles in a net time of 137 min., which, with so heavy a train-load, showed excellent work. On to Perth

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the work calls for no special comment, as, after detaching the Oban portion, a load of only six 8-wheelers remained, or about 160 tons. On the falling 1¾ miles from Stirling we attained a maximum of 54·2 miles per hour, and then breasted the 6 miles at 1 in 88 to 103 up to Kinbuck at a minimum of 36, passing that station, 7⅝ miles, in 12½ min. We were twice badly checked by signals approaching Greenloaning, but accelerated to the mile-a-minute rate on slightly rising grades beyond, and only fell to 54·2 miles per hour on the 1 in 163 up to Blackford. So the 9⅝ miles from Kinbuck to Gleneagles, almost entirely rising, and including the check, took us 11 min. 55 sec., and we then ran most cautiously down to Perth, 15¾ miles from Gleneagles, in 16½ min., with many slacks for curves. Our total time from Stirling to Perth, 33 miles, was thus 40 min. 55 sec., practically as booked, or not more than 38 min. net.

I continued my journey the same morning by the down "Postal" from Perth—the fastest train now running over the stretch of line north of Aberdeen, booked to pass Forfar, 32½ miles, in 34 min., and to reach Aberdeen, all but 90 miles, in 97 min. On the morning in question we had the usual load of four 8-wheeled vans and two 8-wheeled coaches, totalling in weight a bare 145 tons, and hauled by a large 4–4–0 engine, No. 138. Stanley Junction, 7¼ miles out of Perth (5 of which are steeply graded up to 1 in 123), was passed in 10 min. 35 sec., and from there we maintained a uniform rate of from 63·8 to 70·3 miles per hour over the undulating stretch of line to Forfar. The 8½ miles from Stanley to Coupar Angus took 8 min. 20 sec.; the 4¾ miles thence to Alyth Junction occupied 4¼ min.; while the 12 miles from Alyth Junction on to Forfar, where we slacked severely, were covered in 10 min. 55 sec. We had thus covered the initial 32½ miles in 34 min. 5 sec., practically as booked. Rapidly regaining speed, the 7 miles on to Guthrie, still nearly level, were reeled off in 7 min. 35 sec.—here there was a very slight check—and the 11⅛ miles thence to Dubton, with the steep descent past Farnell Road, on which we touched 70·3 miles per hour before steam was shut off, occupied exactly 11 min. The 50⅝ miles from Perth to this point had taken us 52 min. 40 sec.—1⅓ min. under schedule time—but the hardest part of the journey lay ahead.

For the 5⅜ miles from Dubton on to Marykirk we took 6 min. 55 sec., and speed then fell to 37·2 miles per hour on the 4 miles up at 1 in 103, 114, 102 and 148 which follow, so that the 3¼ miles from Marykirk to Laurencekirk took 4½ min. On the slightly falling grades beyond we got up to 68·1 miles per hour, and then breasted the Drumlithie bank—4½ miles at 1 in 174, 180 and 139—at a minimum speed of fractionally over 50 miles per hour, covering the 6⅛ miles from Laurencekirk to Drumlithie in 7 min. 10 sec. Down the steep descent to Stonehaven we did not exceed 72·5 miles per hour: up the 2 miles at 1 in 100 to 118 beyond speed fell to 48, rising again to 67 at Muchalls, and falling finally to just under 50 on the 2 miles up at 1 in 127 and 114 past Portlethen. The 7⅛ miles from Drumlithie to Stonehaven took 7 min., the 11⅜ undulating miles thence to Cove occupied 12 min., and, despite a bad slack at Ferryhill Junction for permanent way repairs, a sustained speed of 70·3 miles per hour on the final descent into Aberdeen took us from Cove into the joint station, 4⅞ miles, in 6 min. 5 sec. We had, therefore, completed the journey from Perth in 96 min. 20 sec., or in 95 min. net, the economy of 2 min. evidencing a good, although not particularly startling, journey. I should have liked to included several other trips as also figuring among my best runs of 1913, but considerations of space forbid; descriptions of them, however, will not fail to appear in due course in these columns.

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ASTON GOODS STATION, AVENUE ROAD ENTRANCE.

L. &. N. W. Railway Goods Facilities in the Birmingham District. (No. II.)

By D. H. F. MEACOCK.

WITH such a vast area to cover, containing a big proportion of industrial houses as those in Greater Birmingham, the work of efficiently covering every business of any importance each day, and of conveying goods to the various stations in time for despatch is no light task, and yet it is regularly accomplished. How it is done it is almost impossible to tell. Sufficient it is to say that it is the result of constant thought and application, the work of years of practice, until the staff have become so accustomed to the needs of the traders that the whole business moves with the regularity of the clock.

For the daily collection of traffic the city is divided into various sections, each of which is covered by horse teams from one of the stations. The team arrangements are such that Curzon Street, Aston and Monument Lane stations are enabled to collect and forward traffic to all parts of the United Kingdom. Elaborate arrangements have been made to ensure the prompt handling and delivery of goods and merchandise. With such a huge volume of traffic centreing on this large city, the strictest rules are necessary to ensure that each station shall get its fair share of the work, and that each depôt shall receive that particular class of traffic with which it is best able to deal. These arrangements may be briefly summarised as follows :—

Curzon Street deals with general goods and merchandise traffic for Birmingham proper. No empties are here received. All "empty" traffic is dealt with at Aston, where special accommodation has been provided for the same. Aston also deals, of course, with general traffic for its immediate vicinity ; and Monument Lane takes the general traffic for the Ladywood District. The latter depôt can boast one of the finest warehouses for general merchandise in the country, a large section being specially adapted for the storage of metallic bedsteads and goods of a similar nature, which would be liable to deteriorate if kept in damp places. Bedsteads to the value of £1,000

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STABLES, ASTON GOODS STATION.

each are occasionally despatched to the palace of some Eastern potentate. Here also there is special accommodation for warehousing hops.

The arrangements for despatching goods trains from this centre of activity are of the most comprehensive character. Wagons for the North are, as a rule, taken to Bescot, there to be made up, while those for the South go to Stechford. Traffic from the stations and depôts in the Birmingham area (other than from Birmingham itself) is first taken to Bescot, where it is marshalled, and wagons for the South are sent to Stechford to be amalgamated with the through goods service from Curzon Street. By this means the whole of the traffic from the large towns in the Birmingham district gets the advantages of the through Birmingham and London express goods services.

MONUMENT LANE GOODS STATION.

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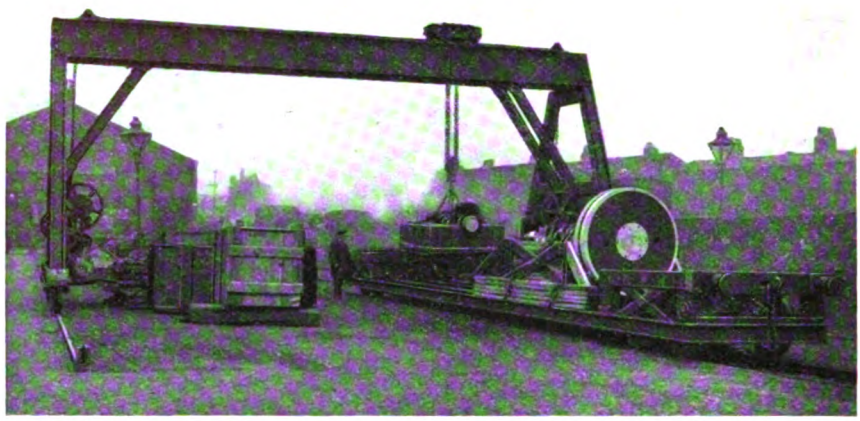

20-TON CRANE, MONUMENT LANE STATION

The principal goods services from Curzon Street are the 8.30 p.m., conveying important traffic, arriving in London soon after 1 a.m. At Stechford the 10.8 p.m. connects with the 8.45 p.m. from Walsall for London. There are also auxiliary services for Birmingham to London traffic in conjunction with the 9.30 and 10.5 p.m. trains from Wolverhampton. The 11.15 p.m. Birmingham to Willesden conveys traffic for branch lines *en route*, as well as traffic requiring transfer at Willesden to the Southern lines. The 8.50 p.m. Curzon Street to Liverpool runs *viâ* the Stour Valley line, picking up only important and perishable traffic for Liverpool proper. For the North, the 11.55 p.m. to Carlisle starts from Curzon Street, and conveys traffic for Crewe, Warrington, and Preston districts, as also to Carlisle for Scotland. This train travels *viâ* Bescot, and is due in Carlisle at 10.20 a.m. For the West, the 11.20 p.m. from

BEDSTEAD WAREHOUSE, MONUMENT LANE STATION.

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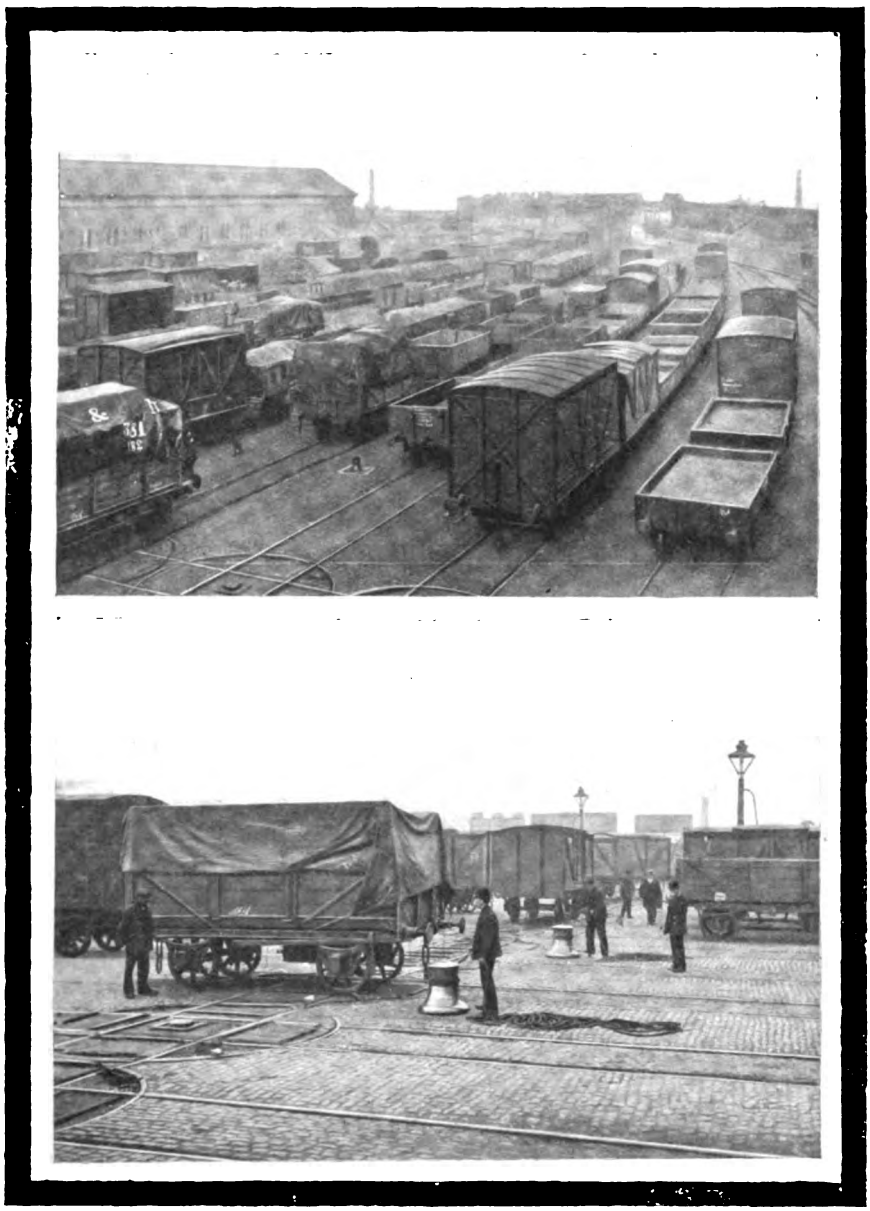
Curzon Street for Abergavenny travels *viâ* Bescot, conveying traffic from Birmingham proper, as also for the Shropshire Union line and for South and Central Wales.

In addition to general goods traffic, these convey other companies' empty wagons collected in the Birmingham area requiring exchange with the parent company by 6



PORTION OF CURZON STREET GOODS YARD. CAPSTANS FOR MOVING GOODS WAGONS.

There are also through goods trains leaving Monument Lane for Birkenhead at 12.5 a.m., Liverpool at 1.10 a.m., Shrewsbury at 2.15 a.m. and 8.50 p.m. for Leeds. a.m. the following morning, in order to avoid incurring demurrage charges. Bescot is the principal centre in the Birmingham area for receiving, in addition to goods traffic

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MR. J. G. HUMPHREYS.
Who is retiring from the position of District Goods Manager, Birmingham District.

mentioned, large quantities of coal traffic, and coal trains are made up and despatched to various destinations. The services of most importance are perhaps the 8.45 p.m. and the 2.45 a.m. coal trains for Willesden.

Birmingham traffic from London is worked on the 8 p.m., 8.50 p.m. and 11.30 p.m. goods train from Camden. The 8 p.m. and 11.30 p.m. trains convey traffic for Birmingham proper and the surrounding area. These trains are broken up at Stechford, and Curzon Street traffic is worked forward immediately, the residue being worked to Bescot and Wolverhampton for distribution to the various destinations. The 8.50 p.m. is a through goods train from Camden to Curzon Street. Traffic from Manchester and Liverpool is worked on through trains to Curzon Street *viâ* Bescot. Other services from towns in the North travel to Bushbury and Bescot, where they join the through Manchester and Liverpool services. The 8.30 p.m. from Liverpool carries traffic from Edge Hill for Birmingham proper and area, also traffic requiring exchange with the Midland Company at Birmingham for West of England stations. This train also picks up, at Bescot, traffic conveyed by the 8.25 p.m. from Manchester for Birmingham proper. There is an extensive exchange of wagons between the London and North Western and Midland Companies at the Exchange sidings annexing Curzon Street goods yard and Lawley Street Midland Company's station. The traffic is chiefly South and South-West of England for North and *vice versa*.

Although the Birmingham goods stations contain ample accommodation for the huge and varied traffic of the district, it is impossible to find room for the necessary adjuncts of marshalling and sorting sidings. To meet this demand, sites have been acquired a few miles away from the city boundary at Bushbury, Bescot, Stechford, and Spring Vale. At Bushbury a batch of nine sidings provides accommodation for traffic from and to the North of Birmingham, while in the huge sorting sidings at Bescot (52 in number, and classified into five divisions) the work of collecting traffic from the surrounding stations, collieries and works and of marshalling for distribution to the various centres, is carried on. Stechford has 10 sidings, in which the traffic from Birmingham and Bescot to the South and *vice versa* is attended to, while the sidings at Spring Vale are used for wagons requiring despatch

MR. T H. SHIPLEY
Assistant to the District Goods Manager, Birmingham District.

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MR. C. B. J. WOODWARD.
Goods Agent, Curzon Street.

to or from the many important works in the neighbourhood.

At Bescot there is established a control office regulating the traffic from Birmingham as far away as Coventry, Tamworth, Burton, Rugeley, and Stafford. "Hump" shunting has been adopted to expedite the work of marshalling at Bushbury and Stechford, each of which have one "hump," while in the more numerous sidings at Bescot three "humps" play their parts in the heavy work of shunting that is there carried on. The locomotives necessary for the hauling of goods trains in the Birmingham area are stabled at Aston, Monument Lane and Bescot, where large steam sheds have been erected.

The goods departments at Birmingham, like most up-to-date business establishments, have during recent years employed the services of the gentler sex, particularly in the Accounts Department. This is, of course, by no means a new departure, as a large staff of female clerks find employment in the goods offices in London, Manchester, Liverpool, and other large centres; and for certain classes of work they are very suitable. As a rule they are the relatives of employés of the company.

Whilst the staff are actually engaged, during business hours, dealing with the enormous volume of traffic involved in the Birmingham area, the lighter side of life is not lost sight of.

At Curzon Street the London and North Western staff have every reason to be proud of the Curzon Male Voice Prize Choir, which won the coveted honour of first place at the Eisteddfod at Crewe in 1911 and 1912, the choir not competing in 1913. This award carries with it the handsome trophy offered for competition among choirs from any part of the system by the London and North Western United Kingdom Temperance Union. Under the skilful guidance of their talented conductor, Dr. Alfred J. Silver, they are doing some excellent work, and will no doubt obtain further honours in the near future. The company have here provided, and also at Aston, rifle ranges which are well supported, the membership including some excellent shots. In 1908 the Birmingham team won the rifle shield, which is competed for annually by teams drawn from all parts of the system, and they have been runners-up each year since the shield was presented for competition by Sir Frederick Harrison, late General Manager.

MR. F. G. LOGGIE.
Chief Canvasser, Curzon Street.

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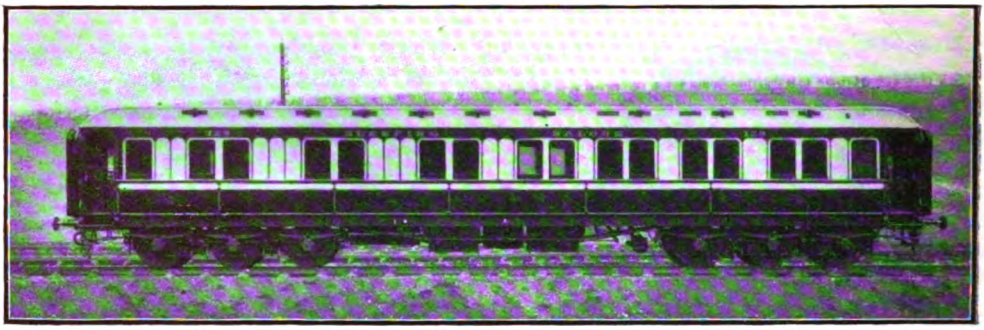

TWELVE-WHEELED SLEEPING SALOON : WEST COAST JOINT STOCK.

Passenger Carriages of British Railways (No. I.).

By BASIL MERCER.

AS a general rule a passenger carriage consists of three principal sections—the body, the wheels, and the underframe. The body may be best described as being that portion of the vehicle which provides accommodation for the traveller, and is the work of the cabinet-maker rather than of the engineer. The underframe is the main part of the vehicle, requiring to be extremely strong, as it receives most of the strains experienced in traffic. The wheels may be attached direct to the frame by means of hornblocks or—the modern way—carried in a subsidiary frame termed a bogie truck. Modern American practice differs appreciably from English in that the body and frame are one, and are usually built entirely of steel. Another important difference is the universal employment in the United States of centre couplings without side buffers. The American method would probably prove unsuitable for our conditions of travel, as the compartment principle necessitates openings for side doors, thus causing a certain lack of strength in the body which is compensated for by allowing the frame to receive all shocks. Much has been written of late years about the danger of English coaches being telescoped in collision, in view of the fact that, if the frame mounts the frame of the coach in front, it carries all before it. It must not be forgotten, however, that, though the American car cannot be telescoped, it can be (and is) completely crumpled up in the event of a really bad smash.

The body of the home-built coach is constructed mainly of wood, strengthened by metal. Oak, teak and other woods having similar properties are used. The frame is built of long timbers of the same woods, strengthened with steel trusses and cross bars, or consists of steel girders and cross members. Diagonal cross bars are introduced in order to transmit equally through the frame the shocks from the buffers fixed one at each corner of the frame. In the case of a train vestibuled throughout it is claimed that the centre coupling and buffer, combined with the Gould vestibule, gives a more "solid" train than the combination of side buffers and flexible gangways. The East Coast partners have adopted the former principle and the West Coast the latter, but after lengthy observation of both systems one is forced to the conclusion that there is nothing in this claim: a good coach rides well with either fitting.

A carriage wheel in English practice is almost invariably of the Mansell type, built up of wooden segments. The spoked wheel is happily uncommon in this country, though very usual both in Europe and the Colonies. In the United States solid steel disc wheels seem to be the favourite pattern, but the Allen wheel (of compressed paper) and similar types have been taken up by some builders. None of these latter, however, are as silent in running as the Mansell wheel, and this is a point of some importance to the traveller, more especially on a journey by night. With the mention of wheels a few words on wheel arrangements may not be out of place. It is a curious fact that England, the cradle of railways, should have been so conservative in adopting the bogie

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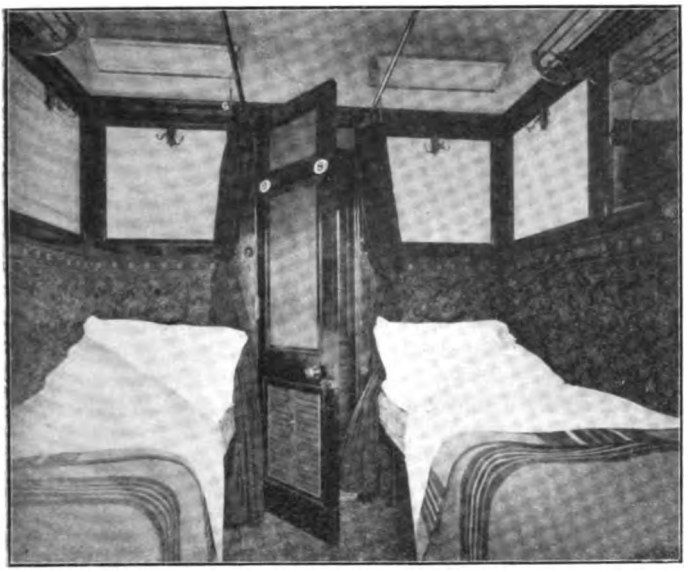

DOUBLE BERTH COMPARTMENT IN SLEEPING CAR: WEST COAST JOINT STOCK.

principle for passenger coaches. Although the six-wheel vehicle has many disadvantages as compared with the four-wheeler or the bogie coach, it has been a favourite for many years on British lines. Other things being equal, it rides harder than the four-wheeler, in spite of several ingenious contrivances to get over the natural dislike of the coach to negotiate even the mildest curve. The North Eastern, Great Northern and several Continental lines endeavoured to get an easier riding coach by allowing a certain amount of play to the centre pair of wheels, while the Highland Railway have coaches in which the two end pairs of wheels are carried by a kind of pony truck. This curious wheel arrangement is also to be found on the Southwold narrow gauge line. Non-bogie eight-wheel coaches may still be seen on the Great Northern and Metropolitan Railways. These are "rigid" vehicles with play allowed to two out of the four axles. Weight and cost of construction are less than in the case of a bogie carriage of the same size, but such a vehicle is bound to be hard on curves. The London and North Western Railway also had eight-wheel non-bogie coaches, 42 ft. in length. The two end pairs of wheels were mounted in a radial truck, the middle pairs being fixed to the frames in the ordinary way. Most of these vehicles were tri-composites with lavatory accommodation and a luggage cupboard, but there were some semi-saloons, first class only, in which the woodwork was quite the most beautiful piece of decoration to be found in any coach then or now.

Four-wheel coaches are not found nowadays on our expresses, though even the most progressive railways on the Continent use them. It is only fair to add, however, that the modern Continental coach of this type is about 42 or 48 ft. long, is carried on very easy springs, and has two lavatories which are accessible by means of a side corridor from every compartment. These coaches ride well even over junctions. The French "Nord" coaches of this type have eight compartments, and the Paris-Orleans nine. The four-wheel coach is no longer built for home use except for suburban or short branch services: it is a much shorter vehicle than its foreign rival, and it does not ride as well. The maximum number of compartments in an English four-wheeler is six (an example of this may be found in a Great Northern suburban train), but five is the usual number.

For main line work the bogie is now universal on most British expresses, and it is the only means of carrying a long coach successfully. The Midland was the first English company to adopt the principle to any considerable degree, and it is probably due to this fact that Midland coaches became noted for their comfort in the days when the bogie coach was a rarity in this country. Both four and six-wheel bogie trucks are used in England, the latter when the coach is either exceptionally long or heavy, though it is occasionally necessary to mount a coach on six-wheel trucks in order that at least one pair of wheels may rest on a locking bar. The Great Western Railway, which lays down a 50-ft. locking bar, has some eight-wheelers 73 ft. in length. The East Coast partners show a preference for the four-wheel bogie for some very heavy modern stock. The four-wheel bogie is cheaper to build and lighter in weight than the six-wheel truck, but the latter gives very smooth riding, as, the wheelbase being so

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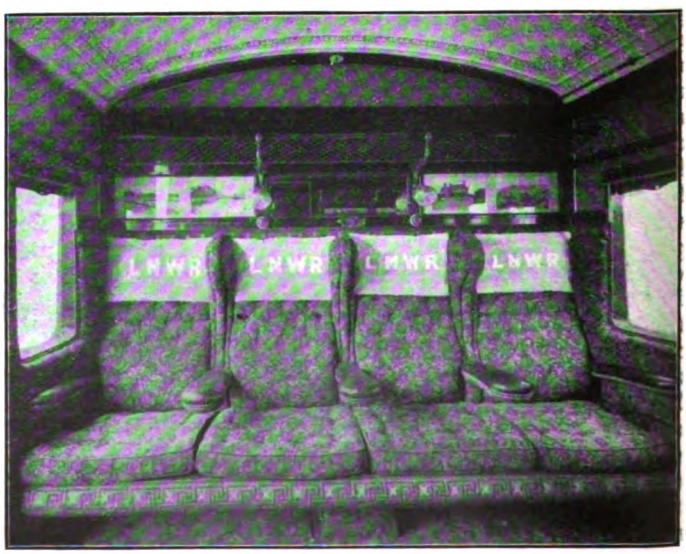
short, the truck will take curves just as easily as the four-wheel, while the additional pair of wheels with its attendant springs absorbs a greater number of the shocks from points and rail joints.

The traffic requirements of a railway will naturally decide, to a considerable extent, the kind of vehicles necessary for conducting the passenger business of the company. On a line where long journeys and more or less lengthy non-stop runs are usual, there must be adequate lavatory accommodation. This may be provided either by giving each compartment a separate lavatory or by the use of corridor carriages. Circumstances alter cases, but it will be generally conceded that the second alternative is the better. For one thing (assuming that the train be also vestibuled), tickets may be inspected and collected *en route*. Another advantage is that, should a restaurant car be included in the make-up, everybody in the train has access to it. Yet another point in favour of the corridor carriage is that it combines a reasonable degree of privacy without being open to the same objections as the open car. The objection that the corridor carriage is wasteful of space is equally true of a carriage with separate toilet accommodation, and the latter vehicle has none of the advantages of the former. The accordion vestibule, so named from its shape, is the one in general use in the British Isles, though the Great Northern, North Eastern and Great Central Railways use the Gould vestibule and coupling, and the East Coast Joint Stock is similarly fitted.

As regards accessories, the most important are the lighting, heating and braking of the vehicle. To take the last first, one may again remark that it is a pity that more than one brake is in use, some companies (the majority) using the Vacuum, while others prefer the Westinghouse. This necessitates many carriages being fitted with both brakes, and care has to be exercised in allocating vehicles to specific services. Steam heating is rapidly superseding the old foot-warmer, and is now to be found on most main line trains and even some locals. In the matter of lighting the oil lamp may be ruled out; it was always unsatisfactory and is now nearly extinct. Gas as an illuminant held the field for a long time until electric lighting was developed to a practicable stage. At present, with the inverted mantle, gas lighting seems to have taken a new lease of life; the light given is extremely good and pleasant to read by, while the fittings are very light when compared with the electric apparatus. On the other hand, electricity possesses two very great advantages over gas. It may be disposed about a compartment or saloon in ways that are both useful and artistic. Most important of all, it is not considered a possible cause of fire in case of accident. Yet another detail which must not be overlooked is ventilation; this is generally arranged for by the now familiar "torpedo" ventilator, a contrivance that is both simple and effective.

The roof of the early railway carriage was very nearly flat: this has gradually become higher and more rounded until we arrive at the elliptical roof now built by so many companies. The attractive clerestory roof in its latest and best form is now the Midland standard (suburban stock on this line has the elliptical roof), and this is the only line on which this type of roof is still being built.

The London and North Western Railway has followed in its carriage practice its general policy of rarely being a pioneer, but, on the other hand, when once a novelty is



9 FT. FOUR-SEAT NON-CORRIDOR FIRST-CLASS COMPARTMENT: LONDON AND NORTH WESTERN RAILWAY.

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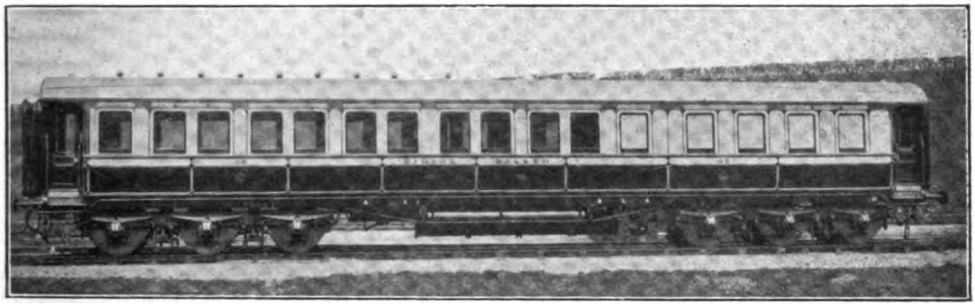
considered an improvement, it has been adopted very thoroughly. This was the case with the corridor principle. Though not the initiators of this improvement, the London and North Western Railway was the first company to run a complete corridor train with restaurant cars. This was the famous 2 p.m. *ex*-Euston, the afternoon Scotch express, still occasionally spoken of as "THE Corridor." This train was formed of bogie coaches 42 and 45 ft. long, with an Edinburgh dining car 65 ft. 6 in. long and two twin 50 ft. 6 in. Glasgow dining cars. The new trains which have replaced this in later years are too well-known to need detailed description here: let it suffice to mention that all the coaches are 65 ft. 6 in. in length by 9 ft. in width, and that the vehicles are remarkably roomy, luxurious and comfortable, though it is a pity that new dining cars of the high-roofed type were not added for the sake of symmetry. These two trains are West Coast Joint Stock, but as the vehicles for the Scotch services are built at Wolverton, they may be considered as North Western construction. Other West Coast Joint Stock coaches are of the same patterns as the North Western's own vehicles of the same dates. There is one interesting point to notice—all the joint carriages are carried on bogies, a not unimportant detail which adds greatly to the comfort of the passenger.

Coming to the North Western's own stock, we find that corridor carriages are the rule on all main line expresses. Older coaches are 50 ft. long, a third having seven compartments and two lavatories. Newer vehicles are 57 ft. long, some thirds having eight compartments, some seven, with either the elliptical or high roof. The latest is only 50 ft. long—a high-roofed seven-bodied coach. There are also composites with two firsts and five thirds, 52 ft. 6 in. in length. The restaurant and sleeping cars are 65 ft. 6 in. long and 9 ft. wide, many of the dining saloons having chairs instead of fixed seats. Until the advent of the elliptical roof both types of coach were built with the clerestories. Both dining and sleeping cars are twelve-wheeled, but some of the older eight-wheel cars may be seen occasionally. Suburban traffic is conducted as a rule with set trains of 50 ft. bogie coaches, generally known, from their first appearing in the London district, as the "Watford Locals," though they are now to be found all over the line. These were fine coaches when they first came out in 1897, and they are still among the best suburban trains running into London. There are a few trains still to be found on local services made up of six and four-wheel coaches, among which may be mentioned the well-known "brown trains" which formerly worked the "Outer Circle" service, but now run between Broad Street and Kew Bridge.



TWELVE-WHEELED DINING AND KITCHEN CAR: LONDON AND NORTH WESTERN RAILWAY.

An account of London and North Western carriages would be incomplete without mention of the 42 ft. "radial," which is described by the late Sir George Findlay in the following words:—"Forty-two ft. in length, with accommodation for three classes of passengers, and a compartment for their luggage, provided with a lavatory for the first-class passengers, mounted upon the easiest of springs, well-lighted by gas, and warmed during the winter, adorned with ornamental woods and the handsomest upholsterer's work, and replete with every convenience and comfort throughout, it embodies in fact in a high degree, the latest development of modern civilisation as exemplified in railway travelling." With this somewhat involved sentence the author of "The Working and Management of an English Railway" describes a type of coach which is peculiar to the North Western. There were several variations of internal

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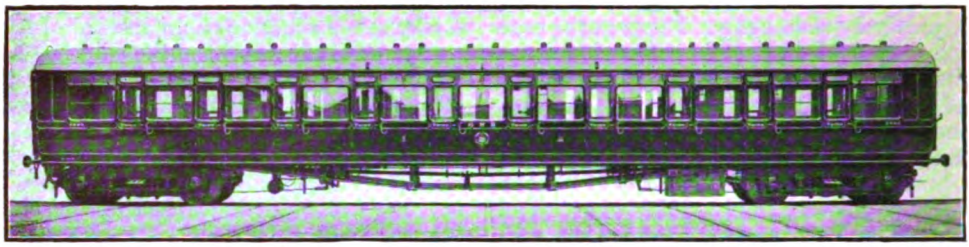
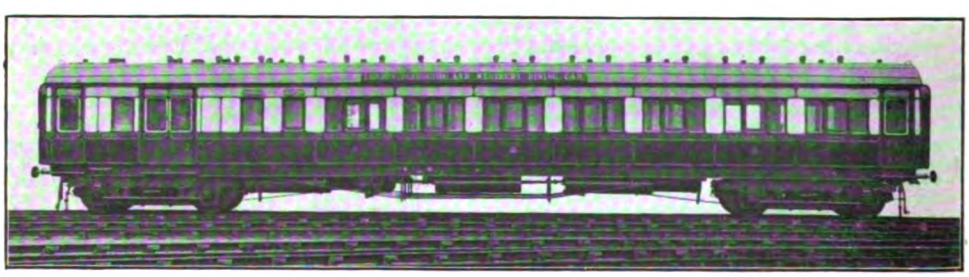


STANDARD 70 FT. THIRD-CLASS CARRIAGE: GREAT WESTERN RAILWAY.

arrangement (lavatories were afterwards contrived for the second and third-class passengers), some with coupés, some all first-class, some all third. The woodwork certainly is extremely beautiful in those examples which are left. The wheel arrangement may be described as a last effort to avoid the bogie principle: the two end pairs of wheels were mounted on a kind of radial truck, the middle pairs being fixed to the frame in the ordinary way. The riding was all right when the road was straight, but it was not nice on curves, in spite of "the easiest of springs." Most of the coach bodies of this type of vehicle are now carried on two four-wheel bogies, thus bringing the coach up to modern practice.

The London and North Western Railway is famous all over the world for smooth riding, and though much of this is due to "the best permanent way in the world," a great deal of it must be placed to the credit of the coaches which have always been most solidly built, rather on the heavy side. As a matter of fact the weights, though above many other companies' vehicles, are by no means excessive when we consider the complex composition of the modern railway carriage. The North Western also excels in saloons and family carriages, as may be seen when the August rush to Scotland takes place, and it possesses in the 2 p.m., already mentioned, and the "American Special," trains which rank among the finest in the British Isles. The latter train is very similar to the 2 p.m., the main differences being the provision of private *compartments de luxe* and a separate kitchen carriage.

The Great Western Railway is ever a line of great things, and amongst its other achievements must be reckoned the largest passenger carriage in the British Isles, a vehicle that measures 75 ft. by 9 ft. 6 in. with the relatively light weight of 33 tons (an eight-wheeled diner of the same dimensions, with kitchen, weighs 36 tons). Such are the coaches built for the famous "Riviera" express. The Great Western officers have made a determined effort to solve the problem presented by the ever-increasing weight of their main line trains; on the one hand, more powerful engines were built, on the other, coaches were constructed that held more people with less dead weight. The eight-bodied corridor third of the late "'nineties" held 54 people and weighed 24 tons, while the ten-bodied coach of to-day weighs 33 tons and seats 80 passengers. Non-corridor vehicles of the same size hold 120 passengers. Such results are certainly evidences of progress, not only in carriage construction, but also in the engineering department for making the use of such big coaches a physical possibility. When comparing old and new stock on the Great Western Railway, it must not be forgotten that the main line stock of 15 years ago was extremely creditable. Bogie vehicles were quite the usual thing and there were many corridor trains. The Great Western was, be it noted, the first English company to run a



70 FT. EIGHT-WHEELED RESTAURANT CAR: GREAT WESTERN RAILWAY.

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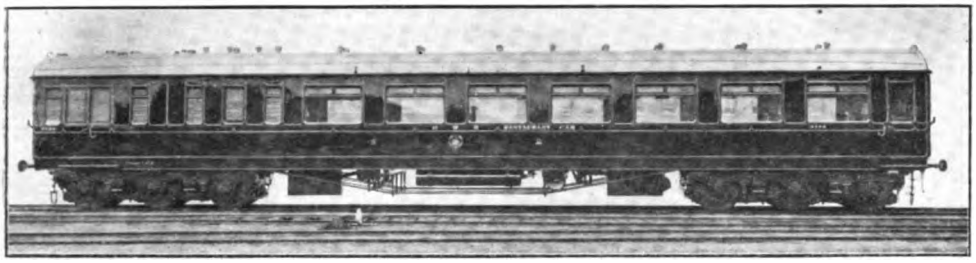
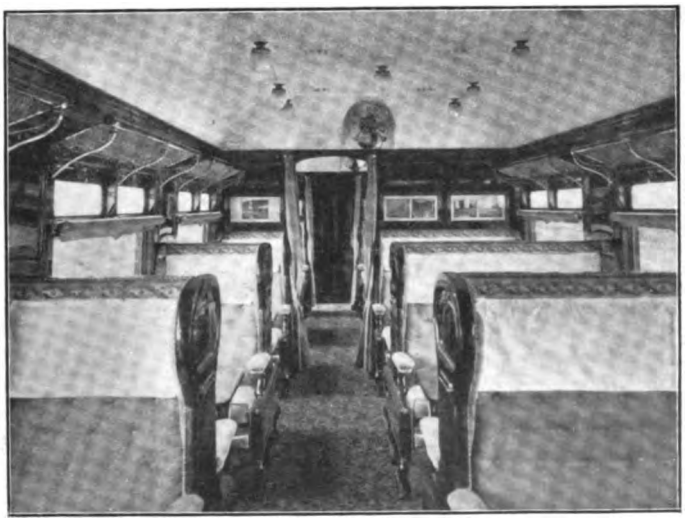


NEW 73 FT. TWELVE-WHEELED RESTAURANT CAR: GREAT WESTERN RAILWAY.

complete vestibuled corridor train: the only blemish being that no refreshment facilities were provided. To quote Mr. W. J. Scott: "The paths of glory led but to the brake van."

Great Western dining cars were for a long time first-class only: this was altered after some years and the cars now are common to both first and third; being used only for meals, never as additional seating accommodation. Until recently all Great Western sleepers were eight-wheeled; the latest car, however, is a fine twelve-wheeler, 42 tons in weight and 73 ft. long. This vehicle is a great improvement on the older cars, which, though by no means uncomfortable, were rather quaint in shape and appearance. In the matter of branch line stock remote country villages have hitherto been treated better than the suburbs of London and the big towns. Like the other railways working over the Metropolitan lines, sets of four-wheelers were provided for the local services. New trains, well lighted and heated, are now being turned out, while a suburban train going any distance is composed entirely of modern bogie vehicles. The latest productions from Swindon are a number of 60 ft. coaches for main line work, owing to the fact that 70 ft. stock may not run "over the Eastern and Western Valleys." The long vehicles are also barred from other localities, including most "foreign" lines.

With the introduction of Pullman Cars in 1875 and its own coaches of the same period the Midland Railway was for many years the only line that made use of the bogie carriage to any considerable extent. The development of the dining car and the present comfort of the third-class passenger are also largely due to Midland influence. And there has been no retrogression from the high standard of earlier years. Coaches continue to improve and a Midland main line express of the present day is all that can be desired. The policy of not building corridor stock for some time after rival lines had done so threw this company behind for a period, but arrears have now been made up and the modern Midland coach with its distinctive design is a most satisfactory vehicle. With the exception of some six-wheeled brakes, main line trains are composed exclusively of bogie stock. The standard coach is eight-wheeled, about 52 ft. long, weighing about 27 tons. Dining cars are both eight and twelve-wheeled, the third-class cars seating 42 and 48 passengers respectively. Twelve-wheeled diners (first, with kitchen), weigh 39 tons; the corresponding thirds, 37 tons. The eight-wheel cars weigh 31 and 29 tons; while the sleepers, also both eight and twelve-wheel, weigh 29 and 37 tons respectively. Other



INTERIOR OF NEW RESTAURANT CAR: GREAT WESTERN RAILWAY.

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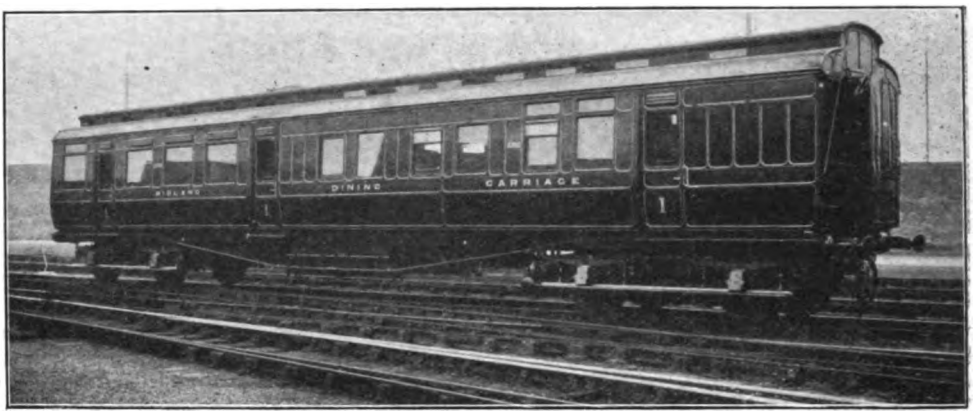
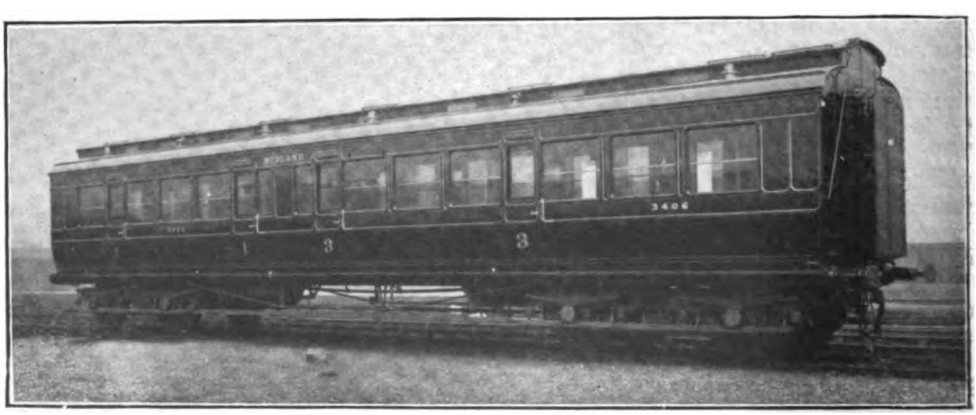


STANDARD RESTAURANT CAR: MIDLAND RAILWAY.

bogie stock, non-corridor, is in use, and there are many varieties. There are twelve-wheelers of three different types, some with the old clerestory roof, some with the new, others with the ordinary low roof. A composite of the latter type was sent to the Paris Exhibition of 1889. This was an excellent vehicle for the period and had ample lavatory accommodation. The weight was light, only 25 tons, but in spite of this the riding was very good. Eight-wheeled non-corridor coaches with the same characteristics are also to be found, some of them weighing only 17 tons. Six-wheeled coaches of the usual English type are used to a certain extent; there are also some with the modern roof, built by Mr. Clayton in 1896. For six-wheelers they ride well. The present design of Midland roof is a combination of the elliptical and clerestory patterns, though the new local sets are built with elliptical roofs only.

The appearance of a Midland express is very fine; all the coaches are of the same shape, which gives the train a symmetrical look, while the rich red livery is a splendid colour scheme. Such an exterior may lead us to expect much from the interior, and inspection does not lead to disappointment. One hardly knows which class to choose: the first with their beautiful woodwork and snowy antimacassars are very handsome; the thirds have a most cheerful appearance—the compartment is roomy and the seats most comfortably shaped, while the interior effect of the Midland roof is decidedly pleasing. Bogie set trains are used for suburban traffic round the big towns, some having the clerestory and some the elliptical roof: these have replaced the sets of straight-backed four-wheel coaches such as used to run over the widened lines to Moorgate Street.

(*To be continued*).



STANDARD COMPOSITE CORRIDOR CARRIAGE: MIDLAND RAILWAY.

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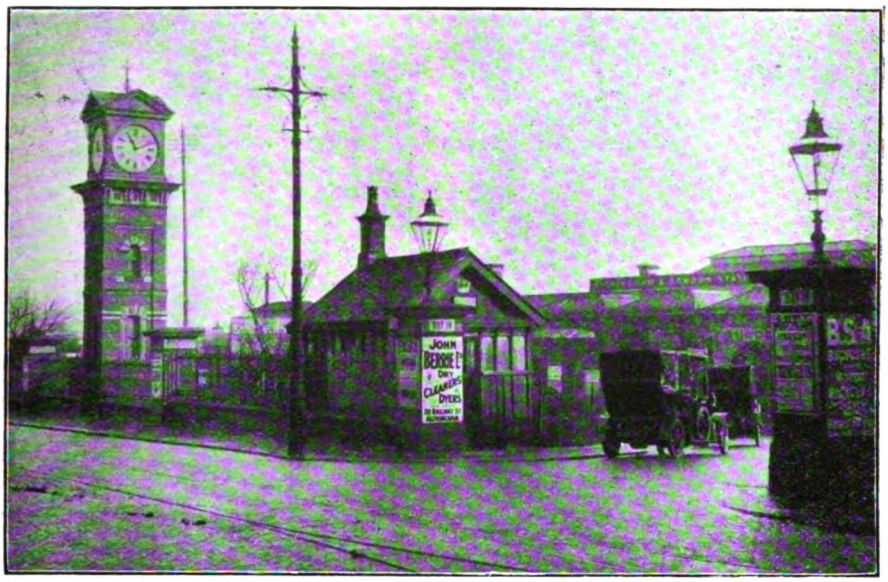

ALTRINCHAM AND BOWDEN STATION, SHOWING CLOCK TOWER AND STATION YARD.

A Popular Provincial Suburban Train Service.

By W. T. PERKINS.

IT would be difficult, perhaps impossible, to find in England a better provincial suburban train service than that provided by the Manchester South Junction and Altrincham Railway, jointly owned by the Great Central and London and North Western Companies. The line was opened for passenger and goods traffic on Friday, July 21, 1849. It consisted of two sections—the South Junction, connecting London Road station with Ordsall Lane, Salford; and the Manchester and Altrincham, which, leaving the South Junction at Castlefield, near Knott Mill, runs almost straight to Altrincham, a distance of eight miles, the total length of the two railways being nine miles twenty chains.

Although projected as an independent undertaking, the Manchester and Birmingham (now the London and North Western) and the Sheffield and Manchester (now the Grand Central) Companies subscribed nearly the whole of the capital, the only shares allotted outside being a few which were given to the Earl of Ellesmere, in compensation for loss anticipated as the result of the stoppage of the "swift packets" provided by himself and his predecessors on the Bridgewater Canal, the course of which is parallel with the line over virtually its whole length. The boats, which the writer well remembers, carried goods and passengers between Manchester and Liverpool in the pre-railway days and were well patronised.

But it was recognised that the opening of the South Junction line would inevitably lead to a complete transfer of traffic from canal to rail, and one of the conditions made in the share allotment to Lord Ellesmere was that the packet service should cease on the very day the railway was first used by the public. Eventually the shares were sold to the two companies named, who have since remained sole owners, the property being now under the joint personal control of Sir Sam Fay, as General Manager of the Great Central, and Sir Frank Ree, General Manager of the London and North Western.

In construction the Manchester and Altrincham section of the undertaking presented little difficulty. The South Junction line on the other hand had to be carried by a viaduct 30 ft. high over a thickly populated district, penetrated by

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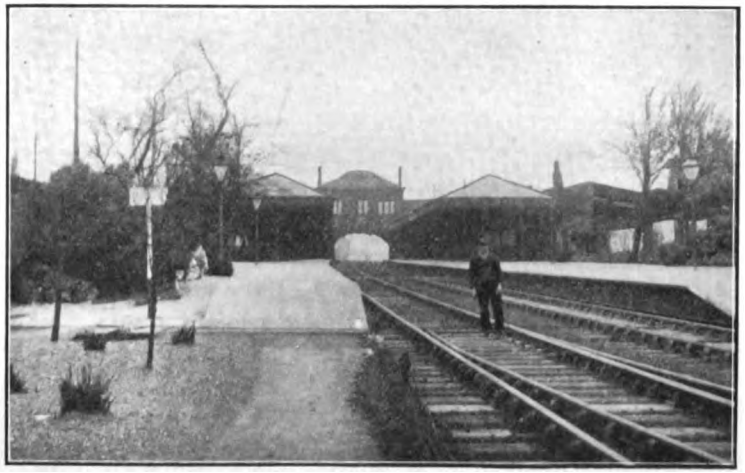
OXFORD ROAD STATION.

OLD TRAFFORD STATION.

OUTSIDE OLD TRAFFORD STATION (STRETFORD END).



STRETFORD STATION.

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many arms and basins of the Bridgewater Canal. The principal station in Manchester for passengers was Oxford Road, but London Road and Knott Mill stations were also made. From the last mentioned the line crossed by four substantial bridges the main road, the Bridgewater viaduct, the approach to the old packet station on the Bridgewater Canal, and the Rochdale Canal.

At the historic Castlefield, it skirted the remains of the Roman castle of Mancunium, from which the city of Manchester took its name. In the comparatively short distance of a mile and three-quarters from London Road to Ordsall Lane, the South Junction metals had to cross 28 public thoroughfares, canals and smaller waterways. Originally it was proposed to carry the railway over these by flat girder bridges, but when one of that type over the Dee at Chester collapsed, arched cast-iron structures were decided upon instead.

These were supplied by Messrs. E. T. Bellhouse & Co., of Manchester, and, with the exception of the one crossing the Rochdale Canal (the span of which was 105 ft.), they had an average span of about 70 ft. The arch over the branch canal at Castlefield was built of brick, and at the time its span of 80 ft. was the widest in the country formed of such material. It was necessary to cross the river Medlock four times within a very small area, and the foundations of the arches had to be carried down from 30 ft. to 35 ft. In other places, where the railway ran close to the same murky stream, heavy retaining walls were required ; and in the end the whole viaduct involved the use of 300,000 cubic feet of stone, 50,000,000 bricks, and 3,000 tons of cast and wrought iron.

The Manchester and Altrincham line, from Castlefield, crossed the Bridgewater, or, as it has always been known locally, the " Duke's " Canal, then passed Hulme Hall, which stood close to the Irwell, and continued close to Pomona Gardens, a well known place of recreation, and the scene of many great political gatherings, attended by Lord Beaconsfield and other party leaders, but now absorbed in the vast estate of the Manchester Ship Canal Company. At Old Trafford, where the railway was driven under Chester Road, a short tunnel had to be made, but this was the only work of the kind needed.

Here was the beginning of the great suburban traffic that has been created in South Manchester during the last half century. The station has since been regularly used by a large number of Manchester merchants and manufacturers. Mansions and houses of a superior character were raised soon after the completion of the railway, and for many years the district had the reputation of being the most aristocratic suburb of " Cottonopolis." On this account it became the home of the famous Botanical Gardens (now enclosed in the " White City " grounds and Exhibition), as also of Henshaw's Blind Asylum and Manchester Deaf and Dumb School, forming, with the chapel which was common to both, the grandest pioneer institutions of the kind in the country, and finally of the Lancashire County Cricket Club. Near to Old Trafford station are the docks of the Manchester Ship Canal Company, and during the last few years large engineering and other works have been, and are still, being erected on the Trafford Park Estate, a short distance from Old Trafford station.

Over 30 years ago the Great Central and London and North Western Committee erected a station, now named the Cricket and Football Ground station, between Old Trafford and Stretford, adjoining the Lancashire County and Manchester Cricket Ground, for the convenience of visitors when there are county cricket matches, and large numbers of passengers make use of the frequent train service from Manchester and other stations during the season. About four years ago the Manchester United Football Club opened their new ground (which will accommodate 60,000 to 70,000 spectators) at Old Trafford, and the Committee run a special service of trains from Manchester (London Road and Oxford Road) to the Cricket and Football Ground station every few minutes for the convenience of the public when there are football matches, thousands being conveyed on every occasion. The distance from the station to the football enclosure can be covered in about six minutes, and the time taken by train from and to Manchester is about eight minutes. Passengers are also conveyed from Altrincham and other stations. When the more important matches are played, special trains are run from all parts of the country direct to this station.

From Old Trafford the railway was carried through Stretford, Sale and Ashton-on-

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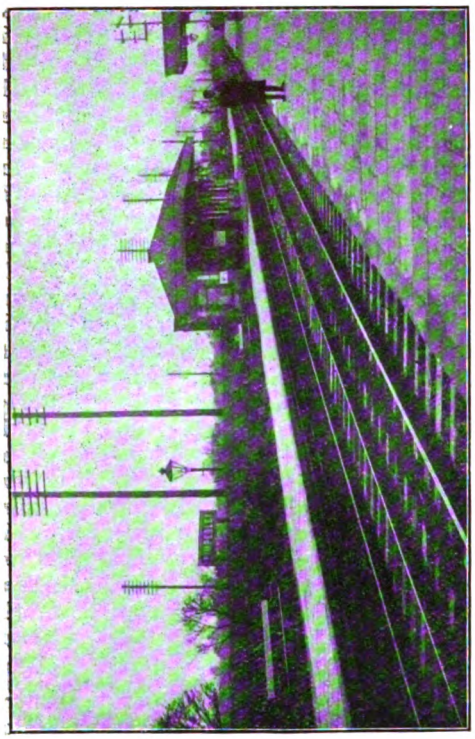
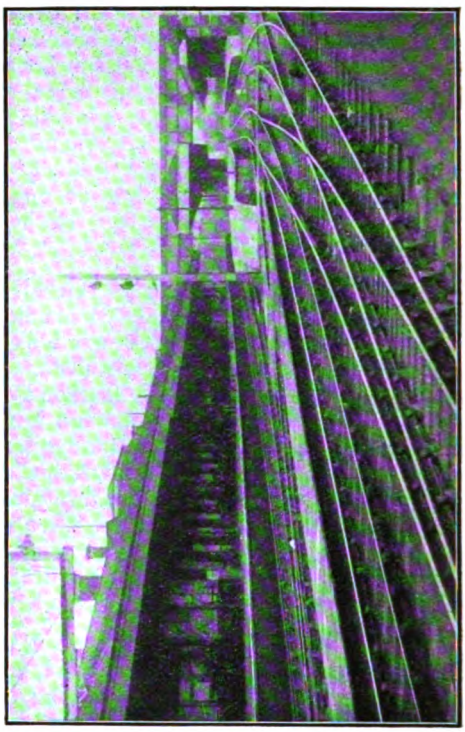
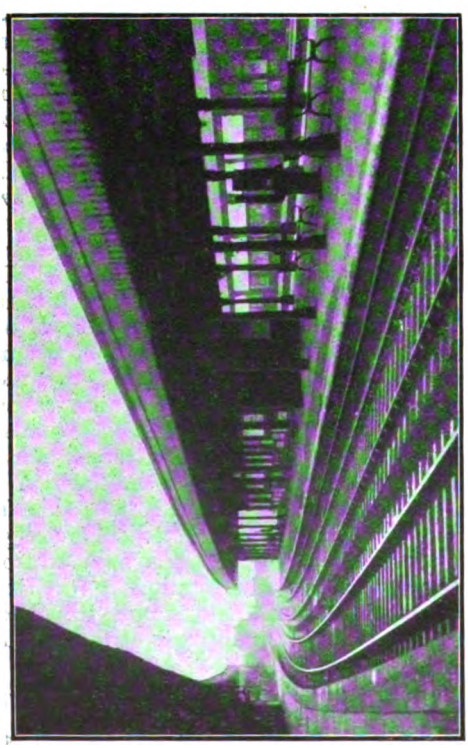


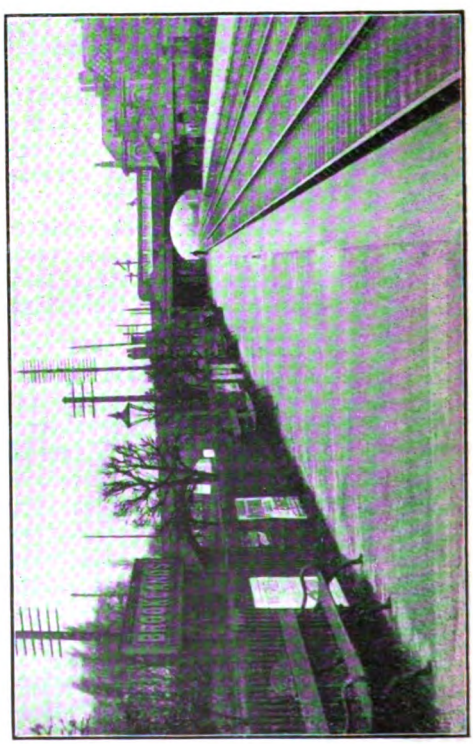
TIMPERLEY STATION.



ALTRINCHAM AND BOWDEN STATION.



SALE AND ASHTON-ON-MERSEY STATION.



BROOKLANDS STATION.

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Mersey and Timperley to Altrincham and Bowden, then sparsely populated, but singularly healthy and attractive rural areas, in which all the elements of peaceful country life were found. Extensive residential properties were few and far between, and the population consisted mainly of humble cottagers, engaged in the cultivation of the soil. But development speedily followed the opening of the line, and new houses began to appear in the neighbourhood of each of the stations. Brooklands did not in the beginning possess a station, but it became such a favourite place of abode that one was eventually established, and it has since shared the success of all its neighbours.

At Broadheath, about a mile north of Altrincham and Bowden station, several important firms have during the last 20 years erected large engineering works, where thousands of men are employed, and within a few mintues' walk of the same station, in another direction, is the beautiful Dunham Park and residence of the Earl and Countess of Stamford. There are many other large houses and lovely gardens in the district owned and occupied by Manchester merchants.

It is interesting to contrast this railway in its earliest days with that of to-day, and that can best be done by reproducing the official record of the jubilee, celebrated in 1899.

"The first train from Manchester on the opening day," states the *Chronicle*, "started at eight o'clock in the morning, but as at that time of the day most people were travelling in the opposite direction it was not fully occupied. The first train from Altrincham, which left at eight o'clock, and notwithstanding some delay at Stretford, reached Oxford Road station within the hour, carried 65 passengers, of whom 18 alighted at Knott Mill and the other 47 at Oxford Road. The next train, leaving Altrincham at 8.40, was the express, and consisted solely of first-class passengers; it carried 15 passengers, and accomplished the eight miles in eighteen minutes. The third train from Altrincham, leaving at nine o'clock, reached Oxford Road within the half-hour, and conveyed 40 passengers, notwithstanding that two omnibuses, fairly filled, had left Altrincham at eight o'clock, another at a quarter past, a fourth at a quarter to nine, and a fifth at nine o'clock. The public had had very little notice of the opening of the line for traffic, and this fact being taken into account the trains throughout the day loaded very well. Some curiosity was exhibited as to how the omnibuses would load, and it was observed that the diminution of passengers by them, especially during the earlier portion of the day, was not remarkable."

In the earliest tables there were thirteen trains each way (about every hour) from eight o'clock in the morning till nine o'clock in the evening each week day, except Saturday, when the last train left Manchester at ten o'clock, and Altrincham at half-past nine in the evening. On Sundays there were nine trains from Manchester and eight from Altrincham. All except the express, which was first-class only, carried first, second, and third-class passengers. There was only one express each way daily during the week. This left Altrincham at 8.40 in the morning and returned from Manchester at 1.15 p.m. accomplishing the journey in 20 minutes, while the time occupied by the ordinary trains was half-an-hour.

Since its inauguration, the line has opened up communication at Altrincham with the Cheshire Lines in the direction of Northwich and Chester; and at Deansgate Junction (Timperley) with the Cheshire Lines to Stockport; at Timperley Junction with the London and North Western Company's line to Broadheath, Lymm and Warrington. The Cheshire Lines also connect with the Manchester South Junction and Altrincham Railway at Old Trafford, and run a frequent service of passengers and good trains from Manchester (Central station) to Altrincham, Hale, Knutsford, Northwich, etc. All the stations on the Manchester South Junction and Altrincham line have been re-built and enlarged during recent years. A large number of goods and coal trains travel over the line daily between Manchester (London Road) and Ordsall Lane, as also between Manchester and Altrincham; while Deansgate Junction (Timperley) and Altrincham traffic is conveyed to and from all parts of the country.

Instead of the 26 passenger trains which were found to be ample when the railway was opened, there are now 161 trains daily. Between 5.55 a.m. and 11.40 p.m. no fewer than 78 trains run from Manchester to Altrincham and Bowden, and there are 83 in the opposite direction. Year by year the volume of week-day traffic has grown, but on Sunday 22 trains each way are sufficient to meet all requirements. It is, indeed, essentially a business man's line, and ranks as one of the most popular in the suburbs of any provincial centre of England.

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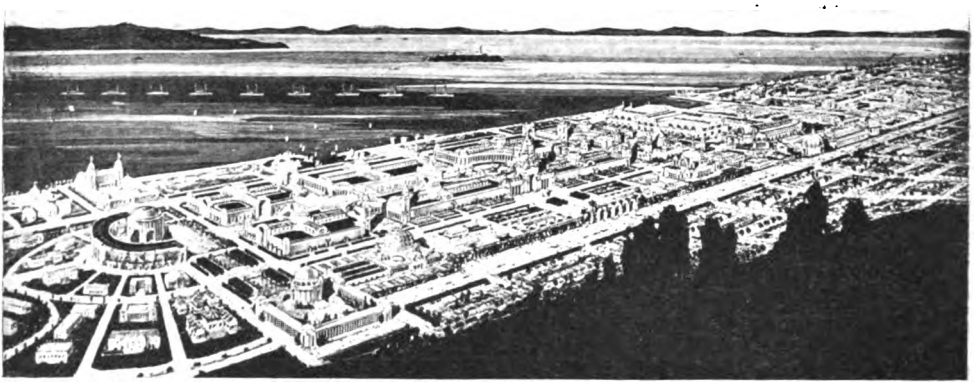

A BIRD'S-EYE VIEW OF THE PANAMA-PACIFIC EXPOSITION (SAN FRANCISCO, 1915).

The Sunset Route of California.

By J. NOLAN.

THE average "stay at home" Englishman knows but little of California, and still less of her railways. In point of fact, one may say that the knowledge possessed by many people is confined to the information gleaned from the advertisements of a certain wine which shall be nameless. It has always been a reproach that Englishmen travel but little beyond the confines of their own "tight little island." But there is a growing tendency towards a wider range of interest. Information about other parts of the world is eagerly absorbed nowadays, and it is with the object of stimulating that interest that the present article is written.

California has long been known as "The Land of Sunshine, Fruit and Flowers," and right well is the reputation deserved. Her glorious mountains and rivers are amongst the great wonders of the world. Her smiling valleys and sunny slopes are rich in health-producing properties; the productiveness of her soil shows in unmistakable fashion that Dame Nature has liberally endowed her with the greatest asset a nation can have—agricultural wealth. Favoured in all these respects, and with a climate of surpassing dryness, small wonder that California has attracted the flower of this country in the past decade.

But it would take volumes to describe the country as a whole. Much literature has already been devoted to the beauties, the historical interests, the claims of sunny California as a resort for the sportsman, the worker, and the farmer; much more has yet to come. There is every facility for golf, polo and hunting. As for fishing, the rivers positively teem with the finny tribe in every possible variety, big and little, and the enthusiastic disciple of the great Izaak would rhapsodise for ever, once he had tasted the joys of whipping its waters.

Talking to a friend who knows the country from end to end the other day, the writer asked him: "How is it one never drops across people who have been out to California and come back here?" He smiled, and answered: "That's an easy question—they don't. People who have been there once, become so charmed that they stop there for ever." One may say that he was an enthusiast. Apart, however, from that point of view, there is not the slightest doubt that the country offers

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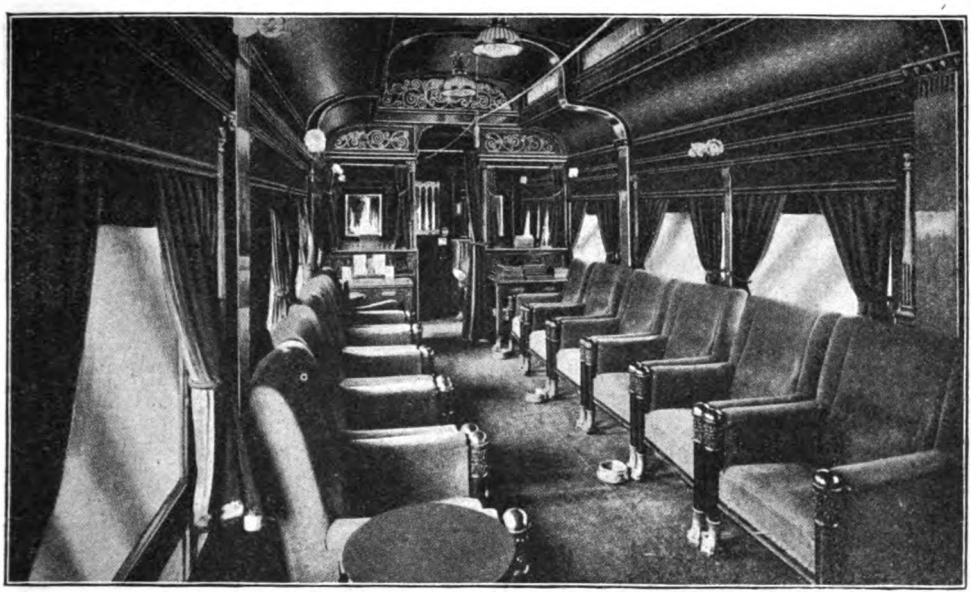
numberless advantages and facilities for the modern "Globe Trotter." A grand, picturesque place, with all the attractions of bounteous Nature, coupled with the beauties created by the hand of man, California calls with insistent voice for recognition. What is more to the point, she is getting it.

However, it is not with the geographical beauty, or the richness of the land, that we are at present concerned, interesting as those aspects may be. Much information of this character is already available, and further details can readily be obtained. But in reference to the railways of California, and "The Sunset Limited" in particular, more may be said. Happy name! One pictures the glow of the setting sun, as one reclines in a luxuriant easy chair in the "Observation Car" of this train. The sky changing with kaleidoscopic rapidity from deep blood red to delicate shades of orange. The calm hush of a summer's eve; the faint blue haze hanging in the air presaging such another day to-morrow as we have just enjoyed; the very silence is significant, and makes one fancifully dream dreams and weave the fabric of our lives into more becoming patterns, California ever becoming woven into the weft and woof of the completed garment, until one sighs with that complete satisfaction which a contented mind alone can give.

The track travelled over by the "Sunset Limited" is scientifically constructed so as to be quite dust-proof. The whole route is protected by electric automatic block safety signals, as to be practically "fool-proof." We in England have had bitter experience within recent years of the desirability of such equipment. In California the idea has been in operation for years with perfect success. The engines which haul the train are equipped for burning oil fuel. The absence of coal means no smoke, grit, and cinders, and in many cases the oil is also used to lay what very little dust there is.

For this train vehicles of the following classes are employed:—

(1) Library observation sleeping cars, consisting of ten sections; the cars are finished in a variety of rich woods, such as Cuban mahogany, Circassian walnut, and vermilion wood.



THE LUXURIOUS OBSERVATION CAR.

(2) Two-compartment drawing-room standard sleeping cars, containing, in addition to their ten sections, two compartments with one of which a drawing-room may be thrown *en suite*. All are finished in rich mahogany.

(3) Drawing-room standard sleeping cars, including twelve sections and one drawing-room, all finished in mahogany. Smoking room and men's lavatory in English oak.

(4) Tourist sleeping cars, having fourteen sections, with mahogany finished and rattan upholstery. The men's lavatory adjoins a

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smoking room on the same scale as in the standard sleeping cars—a distinct innovation. A spacious kitchen, with range and sink, is also provided.

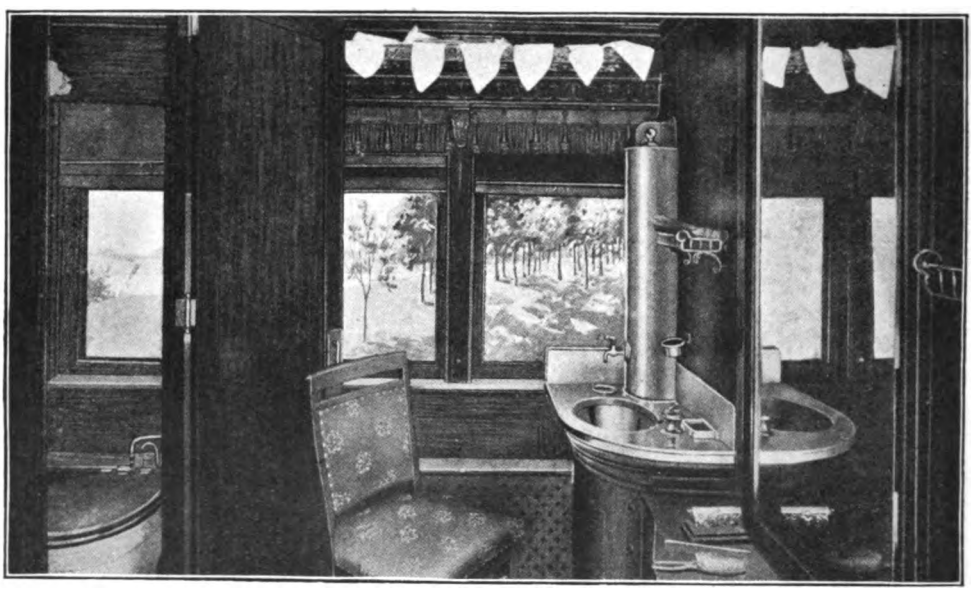
(5) Dining cars, affording service of the highest standard of excellence; and

(6) Dynamo baggage car, where is generated the current that lights the whole train brilliantly.

Handsome and complete though the equipment is, it would be of little avail without a high-grade staff, and the directors have seen to it that the *personnel* is thoroughly in keeping with the equipment. One other feature of importance is that every train on the system has telephonic connection thirty minutes before departure. The telephone is in the Observation Car and passengers may thus get in touch with their friends at the following points en route: New Orleans, Los Angeles and San Francisco.

The "Sunset" line provides trains which are really travelling homes. Let us suppose our traveller is fond of ease to the point of luxury. He selects a drawing-room with a compartment *en suite*. There he has absolute comfort and privacy for just so long as he desires. He has the heating and ventilating apparatus under his own control, his dressing table, with ample mirrors, cabinets and drawers. If he becomes bored with his own society, there is the library or observation car for him to lounge in. The passenger who prefers a reservation in the standard sleeping car, settles comfortably into a seat, luxuriously upholstered. In the lavatories, spacious, and with dressing mirrors from end to end, toilet facilities are complete. In the cars where a smoking room adjoins the men's lavatory, the smoking room occupies the additional space of a full compartment, so that no lavatory room is sacrificed. The same methods are adopted in the tourist cars as have just been described. They are real cosy "nests of rest," and one sinks into them with pleasurable contentment.

Such, in brief, is a description of the comforts which await the traveller who goes to California. Much more could be said, but my allotted space has long drawn to a close. However, this subject will receive further attention in a future issue of this magazine, with particular reference to the great Exposition shortly to be held in San Francisco. Then, perchance, the writer may be permitted to take his readers step by step across the country and make it more clear than is now possible what it really is. The accompanying illustrations do scant justice to the actual trains, but they will suffice to give some idea of the real thing. The best way to get at realities is to make the tour and judge for yourselves. Now, then, "Who's for Californa *viâ* the Sunset Limited?"



VIEW OF THE DRESSING ROOM.

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PASSENGERS DETRAINING AT PADDINGTON STATION: LONDON ELECTRIC RAILWAY.

To Paddington by the London Electric Railway.

RECENT years have produced so many developments in London transportation machinery that it is not always easy to keep count of the various phases or to appraise the real value of individual stages of progress. For this reason the importance of the 36 chains of "tube" mileage added on December 1st to the system of Underground lines available for public traffic has yet to become apparent. Already, however, large numbers of passengers have utilised the new extension, aggregating about 10,000 on the opening day, with increases each day since; and in due course there is every indication that the Edgware Road–Paddington section, short as it is, will rank as one of the most important and valuable links in railway inter-communication in the Metropolis.

The general features of the work involved, as well as certain other aspects, received attention in the December RAILWAY MAGAZINE; but as the line was still not quite completed and public traffic had not commenced at the time of publication, it is thought that the importance of the subject justifies further reference, especially as several matters of interest can now be referred to, and pertinent illustrations reproduced.

On the higher level the finishing stages are still in progress; but of the four above-ground connections with the booking hall three are in use. The Praed Street entrance, characterised by the usual UNDERGROUND features, is conveniently located alongside the Great Western Railway Hotel, with the arrival side carriage road between. Inside the Great Western terminus a stairway connects near the buffer stops of No. 9 platform. This stairway is partly in replacement of one of the inclines previously provided to connect with the subway to the Inner Circle station, and the remainder of the older connection supplies access to the departure side of the upper station. The fourth connection, to the new arrival platforms being added to the Great Western station, will not be ready for some time.

The booking office is bowshaped, with six ticket windows, and is claimed to be one of the most convenient of its class. Here tickets are issued to all Great Western stations as far as Reading (including branches), as well as to all parts of the

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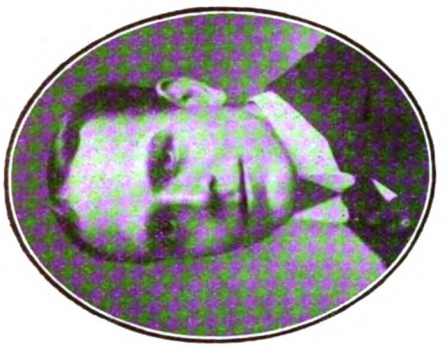

MR. C. S. LOUCH.
Accountant, Metropolitan District and London Electric Railways.

MR. J. P. THOMAS.
Superintendent of the Line, London Electric, City and South London and Central London Railways.

MR. W. A. AGNEW.
Mechanical Engineer, Metropolitan District, London Electric and Central London Railways.

MR. H. H. DALRYMPLE-HAY, M.INST.C.E.
Consulting Engineer to the London Electric Railway and the Underground Electric Railways Company of London, Ltd.

Underground system, though through tickets cannot yet be obtained at other "tube" stations. On the other hand, throughout the suburban area the Great Western Company issues through and season tickets to "tube" stations. A number of Electric Automatic Ticket machines have also been provided for taking the peak loads off the booking office, so that, in reality, very comprehensive and convenient facilities are available. From the booking hall the escalator tunnel descends to the lower level. It is claimed that the equipment here provided is unique, in that the two escalators, with a fixed stairway between, are placed in one diagonal 21 ft. tunnel, the vertical fall being of 40 ft. At the foot of the ascending escalator a knock-out switch box is provided, whereby either can be instantaneously stopped, should need arise.

The impression conveyed is very favourable, and is enhanced by the distributing area at the foot of the escalators which have capacity for handling 20,000 passengers per hour in both directions. Here is a wide space, with walls curved to form about three-quarters of a cylinder some 40 ft. diameter, the floor constituting the chord; and from this four wide artistically designed openings—two on each side—lead to the platforms. Here, as also on the platforms, the scheme of lighting is somewhat interesting. On the departure platform high power metal filament lamps are placed under hexagonal shades. In the distributing area and on the arrival platform the lamps are shielded by large inverted hemispherical opal shades. We understand that these two methods are here adopted for comparative purposes.

The platforms are of usual tube type. On the arrival side a shunt signal is placed at the departure end, this being of double lamp type but showing only a small green light when clear, though the yellow lens is of ordinary size. A single starting signal is placed a short distance along the tunnel, and beyond it an illuminated arrow indicates which of the terminal stubs is to be entered by a train proceeding onwards for reversal purposes. The signal cabin is placed at the northern end of the departure platform, with an eight-lever frame, illuminated diagram, and the usual characteristics of McKenzie, Holland and Westinghouse electro-pneumatic signalling. At the departure end a lamp signal of "repeater" type controls exit of trains, the "starter" proper being placed a few yards into the tunnel.

Public traffic commenced on December

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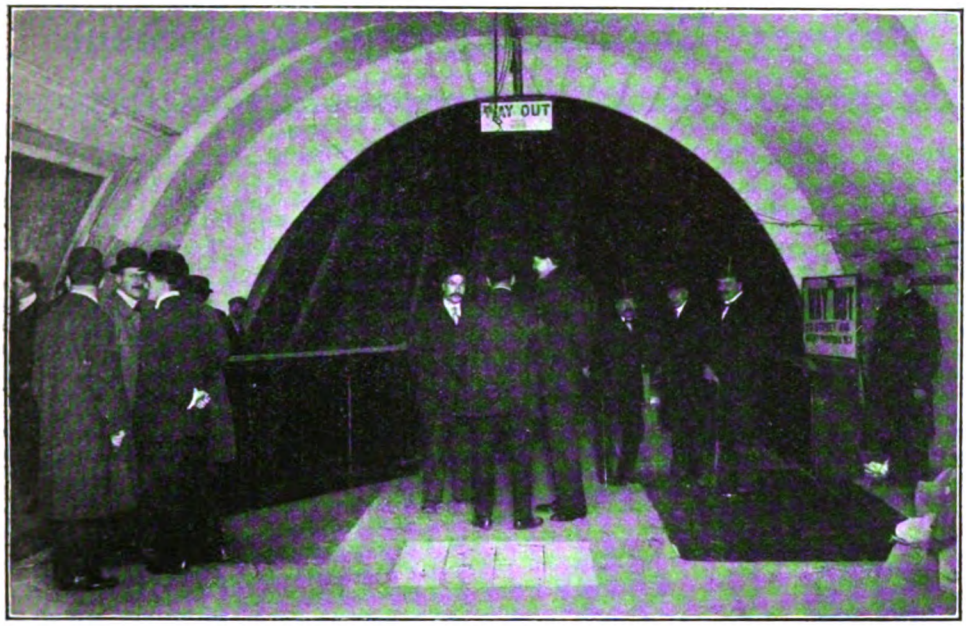

THE ESCALATORS AT PADDINGTON STATION: LONDON ELECTRIC RAILWAY.

1st, but for several days previously trains were running through to Paddington for reversal during the slacker hours, and on Sunday, November 30th, the full service was thus operated as arranged for December, the cabin at Edgware Road being only retained to enable the automatic system to be broken into as required.

A feature of the train service is that the first train in the morning is arranged to connect with the 5.40 a.m. main line train at Paddington; while the last train from the "tube" station is arranged to connect with the last east and west bound "Piccadilly" trains at Piccadilly Circus, the last "Piccadilly" train connecting with the last Highgate train at Leicester Square, which in turn connects at Camden Town with a train to Golders Green, from which station the last Metropolitan Electric trams to North and West Finchley can be joined. Incidentally, in addition to the comprehensive facilities thus provided, it is worthy of note that the complete journey from Paddington to Finchley can be made in about 45 minutes.

To avoid delay to arriving passengers desiring to make close connections with Great Western trains at Paddington, tickets are collected on the tube trains between Edgware Road and Paddington. At present 375 trains in each direction are dealt with every week-day at Paddington. As soon as new side-door rolling stock now on order is delivered this will be increased to about 400 and the running time further accelerated.

In our last issue the offices of Messrs. Z. E. Knapp and A. R. Cooper were incorrectly stated on page 448. We understand that Mr. Knapp is the Chief Engineer to the Underground Electric Railways Co., London, Ltd., and the City and South London Railway, while Mr. Cooper is the engineer who is responsible for the Metropolitan District, London Electric and Central London Railways.

In view of the interest aroused by the interesting series of portraits of chief officers of the railways given last month, we have pleasure in amplifying them with portraits of Mr. Dalrymple Hay, Consulting Engineer; Mr. J. P. Thomas, Superintendent of the Line, London Electric, Central London and City and South London Railways; Mr. C. S. Louch, Accountant, Metropolitan District and London Electric Railways; and Mr. Agnew, Chief Mechanical Engineer, Metropolitan District, London Electric and Central London Railways.

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Railway Engineering and Equipment.

Coinfreed Machines in Railway Service.

TEN years ago, while the coinfreed sweetmeat machine was a common sight on railway station platforms, there were very few places where machines of this class were employed for the sale of tickets. Since then, however, the coinfreed machine has become a usual medium for the sale of small-fare tickets covering journeys in great request; while the adoption of the closed-platform principle at the great termini and important junction stations has created a new field for such apparatus. There is no need to emphasise the advantages of the platform-ticket principle, which has already received considerable attention in these pages, except that the list of stations where it is adopted is now a large one and is constantly being added to. Among the latest additions may be mentioned Liverpool Street, Fenchurch Street and Norwich stations, Great Eastern Railway, and Victoria, London, Brighton and South Coast Railway. As for the small-fare machines, issuing 1d., 1½d., 2d. or 3d. tickets, they are to be seen at nearly all the underground stations in London, and at many other stations throughout the country. They are also used in some cases for issuing workmen's tickets, though not concerned in the ordinary traffic of the station.

PLATFORM TICKET MACHINES AS INSTALLED AT LIVERPOOL STREET STATION, GREAT EASTERN RAILWAY.

Supplied by the British Automatic Co., Ltd.

The design of machines for this purpose requires consideration of several factors. Experience seems to indicate that the most expeditious form of machine is that wherein a coin is inserted and a handle pulled out. In the hands of experienced travellers, who are mostly concerned, the action results in the supply of a ticket more rapidly than occurs when the coin is inserted and the machine does the rest. Control by the weight of a coin is also somewhat unsatisfactory, seeing that the pennies and halfpennies in circulation vary considerably in weight and thickness, while still remaining legal tender. Indeed, it appears that it is undesirable to attempt too many refinements, while it is hardly necessary to provide against the use of spurious coins, counters and the like, the inducement to fraud being relatively very small.

Complication and elaboration of mechanism are, in fact, hardly called for, and if too much is attempted it is usually found that inaccurate operation, failure to supply ticket desired even though accompanied with the return of coin, and other difficulties, merely cause irritation and exasperation. It is by no means unknown for more elaborate machines to reject coin after coin, the desired ticket being only obtained after punching or shaking the machine; while machines actuated by weight of coin run the risk of a user having to insert three pennies if much worn, to obtain a twopenny ticket. Reference may be made to an actual incident which occured at one of the London stations. A mother was seeing her son off by train, and inserted two pennies in succession, both being rejected by the machine. Eventually, although the coins were probably worn but otherwise good, the ticket collector succeeded in obtaining a ticket by jerking a penny in the slot. Simplicity is, indeed, the usual requisite, especially as it generally carries with it reliability and trustworthiness. So much so that the machines seldom or never call for attention, they can be placed in positions where there is no oversight, or even at "halts" where there is no regular staff at all.

Among the most interesting of these machines are those supplied by the British Automatic Co., Ltd., of Appold Street, London, E.C. Two of these machines are illustrated, for issuing platform tickets—as just installed at Liverpool Street and Fenchurch Street and many other stations. Similar machines are also employed for selling penny tickets and for 1½d. and 2d. fares. These machines will work with coins in all conditions, thick or thin,

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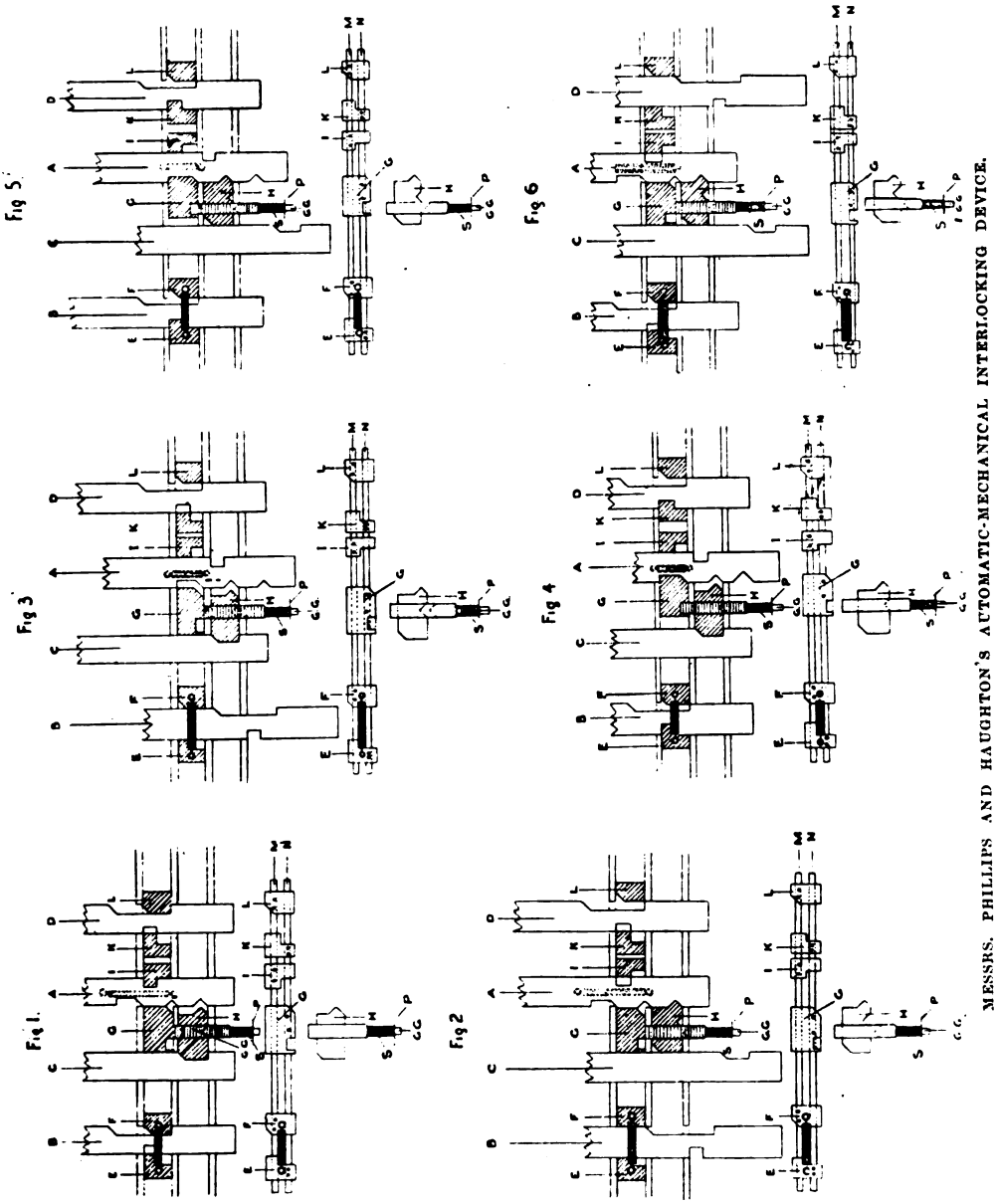

MESSRS. PHILLIPS AND HAUGHTON'S AUTOMATIC-MECHANICAL INTERLOCKING DEVICE.

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except those seriously battered. In fact, they are specially made to work with any coin of the required value which will pass through the slot, it being found in actual practice that there are a vast number of more or less damaged pennies in circulation, including many worn very thin and which are good current coin so far as value is concerned. After insertion of coin a handle has to be pulled, but in practice it is found that a constant stream of passengers with coins ready can manipulate them at the rate of from 50 to 60 per minute, and the tickets are delivered 50 per cent. quicker than is the case with weight-actuated and other non-handle machines.

Developed from the sweetmeat practice of this firm, these machines have been used for small-fare tickets for several years on many railways, they are to be seen in rows at numerous underground and "tube" stations, they are extensively employed for issuing platform tickets, they are installed on lonely "halts" without attention, and in the Colonies and abroad, in Egypt, India, South America and elsewhere, large numbers have been in use for extended periods. In fact, by far the larger proportion of the machines of these classes in service have been supplied by this firm; and throughout a very high standard of efficiency and reliability has been realised.

Parts are interchangeable, there are no spring, motor or electric devices, and the mechanism, while very strongly made, is so simple that it can be at once understood by the average booking clerk. Date alteration is easily effected and the insertion of fresh ticket supplies is a very simple matter.

Automatic Mechanical Interlocking for Rule 55.

ALTHOUGH track-circuiting is considered by many authorities to be the best means of protecting a train or engine waiting at a starting or advanced starting signal, the system is not always favoured, on account of cost or for other reasons. An alternative arrangement, which has the great advantage of low initial cost, has been designed and patented by Messrs. Alfred George Phillips and Alfred Haughton, of 12, King's Road, Hitchin, Herts. From the drawing and the description given it will be clear that the maintenance charges for the arrangement would be practically nothing.

B is the tappet, of the ordinary kind, of a home signal; C the tappet of a starting signal, and D the tappet for a signal for coming out of a siding or through a crossover road, and going towards the starting signal. Where there is an advanced starting signal, B is for the starting signal, and C for the advanced starting. In the channel of the locking box are two lock rods M M. To the former are rivetted the locks F I L, and to N locks E G K. In a separate channel is an independent lock H. The locks G H are unusual in that on the nearer side, G has a square notch and H a bevel notch. In the former, G, a bolt G G is pressed by the spring S. The bolt G G lies above the lock H, but under it is a bevel piece fitting the bevel notch in the lock H. The tappet A is not connected to any signal lever, nor does it work any signal. Its purpose is to move over automatically by the aid of the spring seen under it, and then the tappet can be restored by a miniature lever. One end of the spring mentioned is connected to the tappet, and the other end is secured to some part of the locking box.

For passing a train, the ordinary procedure is to first lower the starting signal, then the home, and lastly the distant—the last named is not illustrated, as it has no part in the arrangement. As soon as the starting signal C is pulled, the lock H holds the tappet A, as seen in Fig. 2, so that, although the lock I is taken out of A by tappet B forcing F to the left, A is not free, as it is held by H. When the train passes, B is put back, and the spring that joins E and F together draws the latter to the left, and therefore also I, which locks A normal, and the release of A, when C is put back, is of non-effect. It follows that with through running matters are normal. Supposing, however, that the line is not clear, and the starting signal cannot be lowered. The home then only comes, and when B is drawn over the lock, F is forced to the right, and I is taken out of A. As C is not over, there is no restraining influence on A, and the spring brings it over automatically as seen in Fig. 3. This does not, however, prevent C from being pulled when the line is clear, but directly B is put back by the home signal being restored behind the train, the spring that joins E and F will force the former into the square notch on the left of tappet B. When this happens, the lock G, being coupled to E by the rod N, enters the notch on the left of A. This frees the bolt G G, which is forced by the spring S into the square recess in the lock G.

The home signal cannot now be lowered for a second train, and so the first is efficiently protected, as seen in Fig. 4. When, however, the starting signal is lowered, as seen in Fig. 5, the lock H is forced to the right, and the bevel on the nearer side of H acts on the bevel on the underside of the bolt G G, so that the latter is taken out of G; but, although the bolt G G has been taken out of the side of G, A is locked again through the same movement by H, and when C has been placed to danger this unlocks A, and the signalman may then push back the miniature lever, and in so doing the lock G is forced to the left and, being attached by the rod M to the lock E, the latter is taken out of B and the home signal is also again free. P is the bracket for holding G G in position. In Fig. 6 the effect of lowering a signal for leaving a siding or going through a crossover road is seen, as then the tappet D has to be pulled, which (unless C has been first pulled) allows the tappet A to fly over, as the lock L is forced to the right, and this, by means of the rod M, takes the lock I out of the tappet A. Although the apparatus has been described in its compulsory form, it can also be made to work permissively where required to suit the working of traffic.

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PERTINENT PARAGRAPHS

Our 200th Number.

FOUNDED in July, 1897, the RAILWAY MAGAZINE initiated a new factor in railway journalism, and the widespread favour which followed indicated that there was an undoubted field for such a publication. No. 100 was reached in October, 1905, and with the issue for February, 1914, a second century will be completed. Throughout the period of nearly seventeen years which have elapsed since No. 1 appeared the RAILWAY MAGAZINE has consistently maintained its original objective, that it should be informative, instructive, interesting and up-to-date and that its pages should constitute means of reference as well as supplying, from month to month, a record of current progress in all branches of railway activity. That this purpose has been achieved is shown by the fact that the RAILWAY MAGAZINE is preserved, referred to and quoted, and that it still remains the predominant monthly publication dealing with railway matters, and is the only sixpenny monthly magazine devoted exclusively to railway subjects. Great improvements have been made in production and presentation, but the RAILWAY MAGAZINE still remains THE RAILWAY MAGAZINE. It is read from cover to cover by thousands of readers in all parts of the world, is referred to by railway officers, and acknowledged by firms who have supported its advertising pages to be, indeed, the controlling factor in railway journalism of its class.

For some time past enquiries and suggestions from readers have been arriving concerning the 200th number, and we have pleasure in announcing that the February issue will be a notable one in many respects. Special articles will be included chronicling railway progress since No. 100 was published, presented in the high-class manner characteristic of the RAILWAY MAGAZINE. Other arrangements appropriate to the occasion are also being made. It is unnecessary to quote congratulatory letters. They are so numerous that selection would be invidious. Sufficient, therefore, to remark that almost every post brings one or more letters containing kindly appreciations, and the management take this opportunity of expressing most hearty thanks therefor; while the steady circulation and progress of the RAILWAY MAGAZINE is evidence that the claims advanced in its favour are real and substantial.

The 200th number will contain extra pages, and an interesting announcement will be made in reference to a popular competition for general readers. For all readers—general and professional—a splendid series of authoritative articles, well presented and profusely illustrated, will be available; the price will be, as usual, 6d.

There is sure to be a great demand for the 200th (February) number, and each regular reader should order early of his bookseller or newsagent, so that he may not be disappointed owing to the magazine being soon "out of print." Every effort will be made to meet the great demand that is anticipated by reason of the lively interest displayed in so many quarters, but all "constant readers" are advised to take the elementary precaution of ordering before publication.

* * *

Railway Bills in Parliament.

IN many ways the railway bills and applications for Provisional Orders deposited for consideration by the 1914 Parliamentary Session are particularly interesting, though none of them, except perhaps the prospective new railway and harbour proposed in County Galway and its possible realisation as part of the suggested new trans-Atlantic route, are of an epoch-making character or include works of exceptional magnitude. As anticipated, the Midland Company propose certain developments in connection with the London, Tilbury and Southend section. Apparently, instead of widening the Great Eastern Railway between Stepney and Gas Factory Junction, a new line is to be constructed between Stepney and Bromley stations. The Barking-Upminster section is to be widened, and a loop built to connect the main line with the Romford branch, which is to be doubled. In conjunction with extension of electric working these proposals offer interesting future possibilities, and we may see within a few years another complete transformation of the Tilbury system in the hands of its new owners.

The Metropolitan and Great Northern Railways are in alliance in respect of the Great Northern and City Railway, part of their proposals amounting, in fact, to the realisation of the original Great Northern and City scheme—to connect directly with the Great Northern Railway and so enable trains to work through. Extensions at the other end, to join the Inner Circle near Aldgate and the Waterloo and City at the Bank, are also included. The same Bill also provides for the construction of a new junction on the Harrow and Uxbridge branch between the Metropolitan and Metropolitan District lines. The Great Northern Railway also provide in a separate Bill for new lines near Wood Green, affecting mainly the connections with the Enfield branch.

The Northern Junction Railway is a revival of the scheme which has appeared in various forms for several years past. This time it is to extend from Brentford, *via* Ealing, Acton, Hanwell, Greenford, Wembley, Willesden, Hendon, Finchley, Hornsey and Wood Green, to

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Southgate, with junctions to and from the London and South Western, Metropolitan District, Great Central, Metropolitan and Great Northern Railways. Widenings and new lines, with the acquisition of the Thames Ironworks, are included in the Great Eastern Railway Bill. The Central London Railway Company desires authority to enlarge tunnels under Holborn and make subways at Shepherd's Bush, Oxford Circus and the Bank of England. Subways at Tottenham Court Road, Piccadilly Circus and Trafalgar Square, covered by the London Electric Railway Bill, indicate further developments in order to effectively link up all parts of the London "Underground" system of railways.

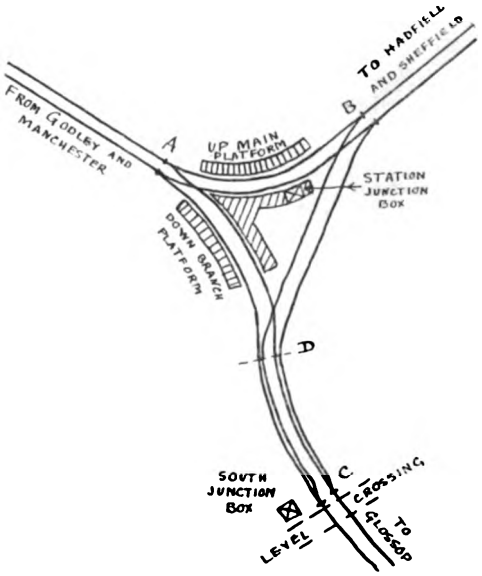
Two new companies make their appearance, the North and South Shields underground electric railway, passing under the River Tyne, and the St. Just Railway, from the Great Western Railway to the coast of St. Just. Revival of powers and extension of time for building the South Western and Isle of Wight Junction Railway in conjunction with the London and South Western Railway are included in another bill. Other projects cover widenings, new lines, junctions, etc., affecting the Alexandra (Newport and South Wales) Docks and Railway, the Great Western, London, Brighton and South Coast, Mold and Denbigh Junction, Cavan and Leitrim, Hull and Barnsley, Mansfield, North Eastern, Rhondda and Swansea Bay and Rhymney Railways, in addition to several of the companies already mentioned in other connections and affecting various districts. Pier and quay widenings and extensions are also proposed at Fishguard, while a number of matters affecting financial arrangements, shipping, construction of piers, locks, docks, harbours, reclamation works, extensions of time, compounding of tonnage rates, removal of wrecks and marine obstructions, and so on, are included in various bills. Among other items the North Eastern Company asks for powers to enable trackless trolley vehicles to be run for the conveyance of passengers, goods and minerals between Newcastle and Gateshead over the High Level bridge, to construct docks near Guisborough, to acquire the Brampton Railway and the Scarborough, Bridlington and West Riding Junction Railway, and to make more effectual provision for the punishment of persons throwing missiles at trains or making unlawful use of communication cords. The transfer of the Invergarry and Fort Augustus Railway is covered by the North British Company's application for Provisional Order. Altogether there are 31 railway Bills and two Provisional Orders affecting Scotland. Two of the former are promoted by Indian and Colonial railways.

* * *

A Peculiar Railway Junction.

We are indebted to Mr. G. Cullis for further particulars of the location represented by Mr. Mackay's photographs reproduced on page 421 of the November Railway Magazine, and in view of the interest which this subject has aroused a diagram, based on sketches supplied by Mr. Cullis, is given herewith, and his remarks may be quoted.

"The Dinting-Glossop branch was originally a single line, and is laid out on such steeply



DINTING STATION AND JUNCTIONS: GREAT CENTRAL RAILWAY.

A—West Junction. B—East Junction. C—South Junction.

Distances: A—B, 14 chains; B—C, 24 chains; A—C, 23 chains; C—Glossop, 67 chains; C—D (gauntletted), about 5 chains. Mr. Mackay's photographs were taken from a position near the level crossing.

falling gradients—1 in 85, etc.—that the terminal platform at Glossop has to be approached with much caution. Several trains from Manchester to Hadfield and other places run *via* Glossop, necessarily continuing the journey therefrom after reversal.

"The Dinting triangle itself includes several features of interest. The junctions are very close together and therefore the base is a very short one, and consequently only two boxes are required to work the three junctions. These are situated: (1) at the east end of the down main platform at Dinting station; and (2) at a level crossing slightly in the rear of the points seen in the lower photograph reproduced. The station box works both the east and west junctions, and is nearly midway between the two points of divergence, so that the facing points are in either case well within the Board of Trade limit for manually worked points. No. 2 governs the south junction, and the signalman there, besides controlling the junction shown in Mr. Mackay's photographs, has some sidings on the west side and a level crossing to look after. The peculiar 'gauntletting' of the lines, as very clearly depicted in the photographs, was probably dictated by the fact that, owing to the existence of the level crossing referred to, it was necessary, or at least desirable, to have the box in its present position, so that the road traffic can be seen and the gates controlled to the best advantage.

"Although the gauntletting of lines is not at all common, one could mention several places

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where the method has been followed; for example, the down local lines between Norwood South and Gloucester Road junctions on the London, Brighton and South Coast Railway. It is not made clear in your paragraph that two sides of the triangle have platforms, the main line and the west side. Trains from or to the Hadfield direction pass just outside the station, by the right hand curve shown in the upper photograph. It will be noted that in the case of stations actually at a triangle junction of this description, it is very rare for all three sides to be connected by platforms for the exchange of traffic. Ambergate, on the Midland, is one of the best-known examples of such a station. Queensbury, on the Great Northern Railway near Halifax, and Earlestown, London and North Western Railway, may also be cited. The best 'parallel' that occurs to the writer of a case similar to Dinting, is Accrington (Lancashire and Yorkshire Railway). Shipley (Midland) is well known as a triangle junction, but has the peculiarity that the main line (or base) is the side unprovided with platforms.

"But to the writer the most unique feature of the Dinting triangle is undoubtedly, not the gauntletting of the lines or the arrangement of the platforms. but the fact, as mentioned above, that the three junctions are controlled from two boxes only. In all the other cases mentioned, and indeed almost universally, a box is provided at each junction. The only other instance the writer can call to mind, where in England two boxes suffice to do the work of three (junctions to collieries and the like excepted), is on the Wirral Railway, between Seacombe, New Brighton and Bidston. The triangle here formed is controlled on the south by Seacombe junction and the east and west by one box situated on the 'base' line (about midway), known as 'New Brighton Junctions Cabin.' This 'base' line is, however, closed, there being no through trains between Seacombe and New Brighton, although the signals, points and the box itself still stand. There are probably a few other instances of the kind, especially where power signalling is in use, as, for instance, the Sturt Lane triangle on the London and South Western Railway."

* * *

A Novelty in Railway Station Architecture.

Platform roofing is now so far standardised that exceptions, as a rule, are worthy of remark: and this is particularly the case with Melrose station, on the "Waverley" main line of the North British Railway. Two photographs, for which we are indebted to Mr. W. F. Jackson, General Manager, North British Railway, are reproduced. They show the peculiar type of construction adopted. The effect is very satisfactory from the artistic point of view, and as the station is kept clean, with the paint in fresh condition, it presents a particularly neat appearance. This station is the centre for a large and increasing tourist traffic. Here, during the season, visitors from all parts of the world arrive, and making Melrose their headquarters, visit the home and haunts of "The Great Magician"—Sir Walter Scott—at Abbotsford House, Dryburgh Abbey, and Melrose Abbey. Indeed, it has become a recognised centre which must be visited by American tourists who arrive at Glasgow and continue their journey *viâ* Loch Lomond, the Trossachs, Aberfoyle, and the Forth Bridge to Edinburgh, where after a round of sightseeing the journey is resumed *viâ* the Waverley route to Melrose, which is well provided with hotels to meet all requirements. While Melrose Abbey is adjacent to the station, numerous conveyances are available to convey visitors to Abbotsford House and Dryburgh Abbey. Many of the tourists continue their journey *viâ* Hexham and Newcastle and visit Durham Cathedral, York Minster and the cathedral cities in the south, while others continue their journey *viâ* Carlisle to the Lake District, the "Shakespeare Country," etc. The journey is made in the

Photo] [*J. R. Sutherland.*

MELROSE STATION: NORTH BRITISH RAILWAY.

Showing unusual type of platform shelter.

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Photo] [*J. R. Sutherland.*

ANOTHER VIEW OF MELROSE STATION: NORTH BRITISH RAILWAY.

reverse direction by many who visit the Continent and England and travel north to embark for home at Glasgow. Melrose is also a favourite holiday resort, and besides being provided with first-class hotels, has also the Melrose Hydropathic overlooking the river Tweed.

* * *

The Ais Gill Report.

NECESSARILY writing some time after the issue of Major Pringle's report to the Board of Trade in reference to the Ais Gill accident, there is no need for detailed consideration here. It is desirable, however, that the matter should not be passed over without brief comment. The cause of the accident was, of course, the failure of Driver Caudle to observe certain signals; all other factors are either incidental or associated. The gas *versus* electricity controversy is where it was. Major Pringle considers that the first fire may have been due to gas, but this was overcome, and the disastrous after-fire is attributed to live cinders and ashes from the colliding engine. Acknowledgment is made of the measures taken by the Midland Company after the Hawes Junction accident, thus disposing of assertions and reassertions in the general Press that nothing whatever had been done. The recommendation that electric lighting is preferable to gas for railway trains is of interest, but is necessarily inconclusive, and it is to be presumed that most railway officers will continue to exercise their own judgment and adopt whichever policy is considered most satisfactory from all points of view. Interesting tables are appended to the report showing that nearly every railway has added to its electrically lighted rolling stock since the end of 1913, but the percentage increases are small, except on the North British (18·9%), South Eastern and Chatham (15%) and Caledonian (11·2%) Railways. It is interesting to observe that, except for a few vehicles lighted by oil, the Great Northern Railway of Ireland employs electric lighting exclusively, aggregating 96·5 per cent. of the vehicles in service. The South Eastern and Chatham comes next with 61·7 per cent. of electrically lighted coaches, the other companies recording relatively considerable proportions being the Great Central, London and North Western, London and South Western, and London, Brighton and South Coast. Other recommendations in favour of detonator-placing machines, cab signalling, flare lights and so on need not be considered in detail at this stage.

* * *

Railway Progress in Germany.

IN Germany, as in other countries, the revenue derived from railway freights affords, as a rule, an excellent indication of national prosperity. It is officially reported that the income derived from the Government Prussian Hessian Railways in 1912 was larger than in 1911. In 1912, £120,000,000 were derived from railway traffic as against £112,000,000 in 1911, showing a net surplus of £8,000,000, equal to an increase of 7·14 per cent.; £79,500,000 were derived from goods traffic as against £73,800,000 in 1911, *i.e.*, an increase of £5,700,000 as against an increase of £5,640,000 in 1911; £33,600,000 were derived from passenger and luggage traffic as against £31,500,000 in 1911, *i.e.*, an increase of £2,100,000 as against an increase of £1,400,000 in 1911. During the autumn of 1912 the Government Railway Administration was unable to supply enough trucks for the goods traffic, otherwise the increase would have been much larger. If the first nine months of 1912 be compared with the same period in 1911 there is an increase of 8·9 per cent. as against an increase of 7·8 per cent. in 1911. "It is remarkable," says the British Consul-General at Dusseldorf (Mr. F. P. Koenig), "that ever since 1908 there has been a great increase in the traffic, amounting in the case of the goods traffic to an increase of 29 per cent. The goods

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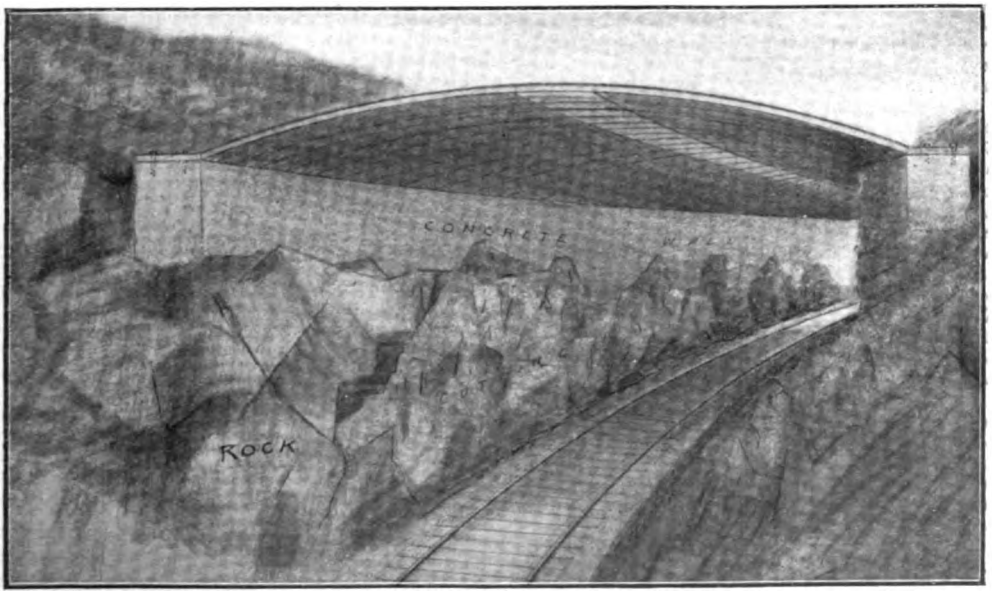
traffic of the first nine months of 1912 turned out to be a record and completely took the railway administration by surprise; the result was that towards the end of 1912 the railways were absolutely unable to meet the requirements of the public in trucks, locomotives and railway men. All the goods stations became congested, empty trucks were wanted everywhere, and the losses to the public through insufficient railway service must have been very large indeed. In the coal mining district of the Ruhr Valley the railway administration provided, during the month of September, 1912, an average daily supply of 30,651 trucks, *i.e.*, 16·6 per cent. more than the average daily supply during the month of September, 1911, and still this number was by a long way insufficient to meet the existing demands. Round about Cologne the goods traffic got congested to such an extent that the only way to deal with the congestion was the refusal on the part of the railway administration to accept any fresh goods for four full days. The congestion was such that the goods stations were full of loaded trains unable to get away to their destinations; at some stations there was such a congestion that unloading trucks was next to a practical imp-ossibility. Under the circumstances deliveries were very much delayed. The worst feature of the congestion was that large quantities of goods could not be loaded up at all, owing to a dearth of trucks. In the coal district of the Ruhr Valley it is estimated that during September and October 200,000 trucks asked for were never furnished, and in November the Rhenish-Westphalian Coal Syndicate stated that daily 10,000 trucks asked for were never furnished. It will readily be conceived what an enormous loss was caused to the mining companies, and, furthermore, the loss in wages to the miners in consequence. It has been estimated that the 200,000 trucks which were not furnished in September and October represented a loss of £10,000,000 to £12,000,000 to the mining companies, and besides this a loss in wages to the miners of £5,000,000 to £6,000,000. This loss is quite apart from that sustained by the buyers of the coal, *i.e.*, the many industries dependent on coal to keep their works going. It is a fact that a number of mining companies had to work short time, as they could not get their coal away from the pits and delivered to the buyers. During this autumn congestion British coal found its way up the Rhine in increasing quantities, and importers of British coal maintained that they have thus made up for the loss of the German market sustained by the coal strikes in the United Kingdom in the spring; but an increasing amount of British coal comes up the Rhine every year. The Government has realised the enormous loss caused by the inability to cope with the demands made on the railways, and it has now decided to increase the number of railway men and also to separate the passenger from the freight traffic by building more tracks and running the passenger and goods traffic on separate tracks, in the more congested districts. It will, however, be some years before these reforms can effectively be carried out."

* * *

The Only Snow Shed in the United Kingdom.

THE Snow Shed is a recognised feature of American and certain Continental railways, but it is not generally known that there is one of these structures on the West Highland Railway, believed to be the only one in the United Kingdom. By the courtesy of Mr. W. F. Jackson, General Manager, North British Railway, a drawing is reproduced showing the construction of the snow shed in question, situated in the Cruach Rock Cutting, to the north of Rannoch station. The cutting is subject to heavy drifting during snowstorms, and for some distance old



SNOW-SHED ON THE WEST HIGHLAND RAILWAY.

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sleeper fences have been put up to prevent, as far as possible, the drifting snow finding its way into the cutting. The shed is placed at the deepest part of the cutting, and is 205 yards long. The top of the rock being very uneven, dwarf concrete walls were constructed to a uniform height of 13 ft. above rail level to obtain sufficient headroom; the width between the walls is 27 ft 6 in. The roof principals are composed of old permanent way rails laid on the flat and curved to a radius of 38 ft.; the portion of the rails resting on the concrete wall are bent level and bolted down to it, and are placed at 6 ft. centres, and bound by 10 malleable iron longitudinal straps 2 in. by ½ in. The corrugated sheets are fixed on these. The centre sheets, however, for the whole length of the shed are only placed in position in winter, as at other times the structure is open so as to allow it to be free of smoke and steam, as the blasts from engines are destructive to the sheeting.

* * *

Suggestions for Train Service Improvements.

NUMEROUS suggestions concerning train service improvements are sent to the RAILWAY MAGAZINE, and where considered desirable these are placed before officers of the railways concerned. In many cases, however, readers fail to take into account associated factors which govern the work of the respective time table departments. It is easy to suggest that a new train or an alteration of an existing train would save five or ten minutes on a particular journey; but in many instances any or all of the following contingencies will effectively rule it out as a practicable proposition. It may be difficult to find a place for a new train, or if introduced it may upset junction and associated arrangements. There may be no justification for increased train mileage or no useful return service for the engine and vehicles. The elimination of a stop or connection may seriously reduce the facilities given by the train for interchange passengers. Or the inter-relation of a particular train with from one to a hundred others may be disturbed by a suggested alteration.

A case in point is afforded by a letter suggesting that by eliminating the stops at Crewe and Willesden Junction made by the 5.20 p.m. express from Lime Street to Euston, the journey between Liverpool and London could be made in 3 hrs. 35 min. That the run could be made in the time suggested may be at once admitted, and our experience is that the engines always have time well in hand; but—and this is the crux of the situation, and where our correspondent has gone astray—the elimination of the Crewe stop would deprive passengers from all over the northern district, apart from Liverpool and Manchester (served by a separate train), from the Lancashire and Carlisle district, and from Preston, Wigan, Warrington, and many other stations, of one of the best services they have to London. There is, in fact, a considerable interchange at Crewe with this train. It may be taken that the railway officers are usually sufficiently wide awake to find out most of the practicable possibilities for themselves; and before suggesting improvements it is desirable that all factors should be carefully weighed. At the same time, several notable railway improvements have been suggested by outside observers, and if well thought out and all aspects properly taken into account, most of our railways welcome such suggestions. They must, however, go beyond the apparently obvious stage, and must satisfy strong practical criticism before they are likely to be adopted.

* * *

Complicated Railway Journeys.

A READER directs attention to certain railway journeys involving peculiar features. Having missed a connection he travelled from Saltburn to Middlesbrough by slow train *via* Guisborough. A short distance from Saltburn station the engine was attached at the rear of the train and so drew it to Brotton station, where it was detached and resumed its first position and thus worked the train as far as the junction for the Guisborough branch. Another engine was then attached in the rear and the train was worked by the two locomotives along the branch into Guisborough station. Here the second engine was left, and the original locomotive then continued the journey to Middlesbrough. There are, of course, several instances where a journey is reversed, with or without a second engine, in order to serve a station on a short branch, as at Templecombe, Somerset and Dorset Joint Railway, and between Byfield and Woodford and Hinton, by Stratford-upon-Avon and Midland Junction trains; but it is suggested that the journey above referred to is unique, in that it necessitates three changes of direction within a comparatively short distance. We shall be glad to hear from readers in reference to other journeys of a more or less similar character.

* * *

Railway Curiosities.

THE same reader suggests that more attention might be given to railway curiosities of various kinds. Many such have been referred to in the RAILWAY MAGAZINE, and in the aggregate, if collected, they would provide material for several articles. Locomotive curiosities are, or have been, numerous, but it is thought that very few have escaped notice. Certain other phases have not, however, received so close attention. For instance, it is pointed out that the access to the platforms at Hampstead "tube" station involves the descent of 331 steps—our correspondent must take the responsibility for having correctly counted them!—as an alternative to the use of the lifts. The question is also raised as to which ordinary passenger train is made up of vehicles belonging to the largest number of railways. Our own recollection is that the 7.8 and 7.20 p.m. trains ex-Newcastle (Central) include between them seven or eight companies' vehicles; but no doubt there are stronger examples than these. Other queries advanced are—whether any ordinary trains are regularly hauled by two engines of different companies, and whether there any signals on a British or Irish railway which, presumably for a special reason, fall to the right instead of the left? Mention is also made of the fact that for about a mile beyond St. John's Road station, Ryde, Isle of Wight, there are two single lines together, giving the appearance of an ordinary double line. Another instance is found on the Highland Railway, where Great

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North of Scotland trains can run alongside Highland trains for over a mile beyond Boat of Garten station.

* * *

The Busiest Holiday Traffic in the World.

MR. W. T. PERKINS' article under this title, appearing in the December RAILWAY MAGAZINE, has attracted much attention, particularly in view of the references to the involved character of the Blackpool traffic in the height of the season. The table of "special events" which had to be taken into account during the exceptionally busy period from Saturday, August 9th, to Saturday, August 23rd, given on this page, will, therefore, be of value. It should be noted that a larger number of the places noted required at least one special train on their own account; and, in addition, there was all the usual and special traffic of the same period carried by the Lancashire and Yorkshire and London and North Western Railways affecting other parts of the respective systems, together with the numerous through trains provided by other companies.

Straight Railways.

IN reference to a paragraph under this heading in our last issue a Leicester reader writes as follows:—"The Buenos Aires and Pacific Railway (Argentine Republic) main line from Buenos Aires to Villa Mercedes, a distance of 425 miles, has, I think, the longest straight stretches in the world. The first section from the capital to Mercedes (64 miles) has 12 curves, the longest straight stretch in this section being 16 miles. From Mercedes to Junin (88 miles) has 8 curves, the longest straight stretch on this section being 38 miles. One mile out from Junin the train bears a little to the right and then enters what I believe to be the longest straight stretch in the world, for it extends for 211 miles; and even beyond, right to Villa Mercedes, the curves are very few and there are several long straight sections. The greater portion of the curves would hardly be called such in this country as they are so slight and none of them call for speed regulation. The above are not the only items of interest on this railway. There is not a single overbridge on the whole

Period.	Event.	Mills finish work on	Mills start work after Holidays on
Sat. 9 to Sat. 16 August	Blackburn, Mill Hill, Cherry Tree, Brinscall, Withnell, Daisy Field, Wilpshire, Langho, Whalley, and Chatburn Holidays	Aug. 8 5.30 p.m.	Aug. 18
,, ,,	Huncoat Holidays	Aug. 8	Aug. 18
,, ,,	Clitheroe Holidays	Aug. 9	Aug. 18
,, ,,	Colne Holidays	Aug. 8 5.30 p.m.	Aug. 18
,, ,,	Accrington, Church, and Clayton-le-Moors Holidays ..	Aug. 8 5.30 p.m.	Aug. 18
,, ,,	Summerseat Holidays	Aug. 8 5.30 p.m.	Aug. 18
,, ,,	Ramsbottom Holidays	..	..
,, ,,	Littleboro', Bury, Heywood, Holcombe Brook, Greenmount, and Tottington Holidays	Aug. 8 5.30 p.m.	Aug. 18
,, ,,	Whitefield Holidays	Aug. 8	Aug. 18
Sat. 9 to Tues. 12	Luddendenfoot Holidays	Aug. 8 5.30 p.m.	Aug. 13
,, ,,	Elland Fair	Aug. 9 12 noon	Aug. 18
,, ,,	Featherstone Feast	..	..
Sat. 9 to Sat. 16	Grectland Holidays	Aug. 9 12 noon	Aug. 18
,, ,,	Skipton Holidays	..	..
Mon. 11 to Sat. 16	Preston, Bamber Bridge and Leyland Holidays ..	Aug. 9 12 noon	Aug. 18
,, ,,	Halifax and Copley Holidays	Aug. 8	Aug. 18
Mon. & Tues., 11 & 12	Trotting Meeting at Blackpool	..	..
Wed. 13 to Thurs. 14	Allerton Feast (Leeds)	Aug. 12 5.30 p.m.	Aug. 15
Sat. 16 to Tues. 19 ..	Bowling Tide	Aug. 16	Aug. 20
Sat. 16 to Sat. 23 ..	Rochdale, Smithy Bridge, Wardleworth, Castleton, Shaw and Crompton, Milnrow, New Hey, Droylsden, Ashton, Radcliffe, Black Lane, Bradley Fold, and Broadley Wakes	Aug. 15 5 p.m.	Aug. 25
Sat. 16 to Sat. 23 ..	Ripponden and Rishworth Holidays	Aug. 15 5.30 p.m.	Aug. 25
Sat. 16 to Tues. 19 ..	Luddendenfoot Holidays	Aug. 15	Aug. 20
Sat. 16 to Sat. 23 ..	Brighouse Rushbearing	Aug. 15 5.30 p.m.	Aug. 25
,, ,,	Sowerby Bridge Feast	..	..
Fri. 15 to Tues. 19 ..	Dewsbury Feast	..	..
Sat. 16 to Sat. 23 ..	Gt. Harwood Holidays	..	..
Sat. 16 to Wed. 20 ..	Low Moor Feast	..	..

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425 miles, nor any river or stream crossed in the last 355 miles. There are no heavy gradients and almost a total absence of cuttings and embankments. The only trees to be seen on the whole line are those planted by the settlers, generally near to the houses for shade purposes. The country is very flat and for the first journey it is interesting, but afterwards becomes as monotonous as on a ship in mid-ocean. I may say the International train from the Atlantic to the Pacific Ocean *vid* the Andes mountains passes over this route."

MR. E. A. WATSON.

The New Locomotive, Carriage and Wagon Superintendent: Great Southern and Western Railway

MR. E. A. WATSON, Manager of the Inchicore Works of the Great Southern and Western Railway, who has been appointed to succeed Mr. R. E. L. Maunsell as Locomotive, Carriage and Wagon Superintendent of the same railway, began his career in America, first with the American Locomotive Company of Schenectady, and later with the Pennsylvania Railroad at Altoona. Returning to England, Mr. Watson joined the Great Western Railway, being engaged in the Swindon Works, and occupied the position of Assistant Works Manager before receiving the appointment which he has now left to take up the office of Locomotive, Carriage and Wagon Superintendent of the Great Southern and Western Railway. His appointment dates from December 1st, 1913.

* * *

Train as "Rest Cure."

REMARKS under this heading in our last issue have elicited several pertinent letters. It is pointed out that if the journey between London and Birmingham was made four times, twice in each direction, all conditions are fulfilled. This is easily possible, and in view of the high class accommodation provided by the London and North Western Railway Company on these trains the term "rest cure" can be readily accepted. If the trains concerned were, it is suggested, the 8.40 a.m. down, 11.25 a.m. up, 2.30 p.m. down and 6.20 p.m. up, the second includes luncheon cars, the third a tea car and the fourth dining cars. A start by the 8.40 a.m. is, perhaps, rather early, seeing that ladies travelling for pleasure were concerned, and therefore the 11.50 a.m. down, 2.5 p.m. up, 4.45 p.m. down and 7.0 or 8.10 p.m. up may also be suggested, though in this case most of the intervals between journeys are rather short. Our comments were based on the assumption that only one double journey was made, in which case the weather conditions in Birmingham, where a few hours would presumably be spent, required consideration. We are informed that on the day in question the weather was better in Birmingham than it was in London. The main issue was, however, the comfort in riding and the high-class accommodation provided, but whatever may have been the actual facts, we can express cordial agreement with the sentiment expressed by the term used—"Train as Rest Cure."

* * *

Automatic Signalling.

WE are asked to explain that, of the illustrations included in Mr. T. Preston's article on "Automatic Signalling," published in the December RAILWAY MAGAZINE, that on page 494 shows an automatic distant signal installed by the British Pneumatic Railway Signal Co., Ltd., on the Great Central Railway, not on the London and South Western Railway as stated; while the power cabin at Clapham Junction, illustrated on page 495, is operated on the low-pressure pneumatic system.

* * *

A Picturesque View on an Important Main Line.

THE view reproduced on page 455 of the December RAILWAY MAGAZINE has been easily recognised by numerous readers. It shows the top of the Dainton bank on the Great Western West of England main line, the photograph having been taken from the mouth of the summit tunnel, looking down the incline towards Newton Abbot station and the Stonycombe quarries. The first correct reply was received from Mr. C. C. Acland, of Halifax, closely followed by several from readers resident in the West of England.

* *

Westerton Garden Suburb.

THE "Garden Suburb" movement has now extended to Scotland, and to serve the Garden Suburb recently built at Westerton, near Glasgow, a new station has been built by the North British Railway. It is situated on the North British line from Glasgow to Balloch and Helensburgh *vid* Singer, at a point near the junction of the branch to Milngavie. A daily service of about 20 trains in each direction is provided, and this, combined with the fine surroundings, is expected to tempt the workers of the city to realise the benefits of country life under favourable conditions.

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At the recent distribution of prizes to the pupils at the technical classes at Crewe Mr. C. J. Bowen Cooke, chief mechanical engineer, London and North Western Railway, referred to the efforts made by the directors to forward the education of students. At Crewe they started afternoon classes with 24 specially picked promising young men, and they had now augmented that number. There were classes in electrical and mechanical engineering. Large numbers of apprentices were able to get off on Friday afternoons and Saturday mornings for these technical classes, and they were paid exactly as if they were at work. An endeavour was thus being made to run practical training in the works side by side with technical scientific instruction. He believed that this was a step in the right direction, and he hoped it would go throughout the country. It was necessary to keep pace with the developments in the engineering world. Crewe works must be kept up to date in every respect; and the students must be up to date with their studies. As time went on all sorts of new problems arose —they were only touching the fringe of many of them now—but he hoped that in Crewe they would adapt themselves to meet all the requirements of the day. During the past year or two some of the most modern productive machinery to be found in any workshops in the world had been put down in the works. Crewe originally was a locomotive engine works, but now made many other things required for the purpose of the railway, and he doubted whether there were any works in the country where there was a greater variety of work produced. They had just completed a new tire mill, which would enable them to produce tires for every wheel that was run on the London and North Western Railway.

* * *

A well-attended banquet was recently given in the Empire Rooms of the Trocadero, London, by the governing body of the Railwaymen's Convalescent Homes (Herne Bay and Leasowe Castle, Cheshire). Sir William Hart Dyke, Bart., Chairman of the London, Chatham and Dover Railway, presided, and in the course of his speech remarked that the Homes were controlled by a large army of voluntary workers and interest in them was taken by all grades. There were 136 railways connected, by sympathy and otherwise, with the institution, and the growth of this connection was worth noting. In 1901 the number of patients was 131 and the staff contributed £800; in 1907 the number of patients was 614 and the staff contributions £4,372, and in 1912 the patients were 2,414 and the contributions £8,180. In conclusion, the Chairman said that for 50 years he had taken part in public affairs, and the one thing that had caused him the greatest anxiety was the grave differences between capital and labour. He often wondered why it was that some sympathetic chord was not struck between masters and men, and he hoped that those present would approach these relations in a most charitable and broad-minded spirit, and whenever trouble and friction arose deal with them with equity, justice and common-sense. Mr. J. Marks (Chairman of the Board of Governors) responded, and said 19,000 railwaymen had gone through the Homes since they were established. Mr. Ness Wilson having in felicitous terms proposed the health of the Chairman, the Secretary (Mr. W. R. R. Culver) announced subscriptions £1,200.

* * *

On December 3rd the prizes and certificates which are given each year in connection with the Lancashire and Yorkshire Railway School of Signalling were presented to the successful students for the session 1912-13 at the Albert Hall, Peter Street, Manchester, by Mr. Arthur Watson, Superintendent of the Line. The school was started in a small way in 1910, when 60 students were enrolled, but steady progress has been made year by year, and for the session 1913-14 over 1,000 students are attending the various classes, which cover every phase of block working. The school contains one of the finest model railways in the country, on which every known device for the safe working of railways is exhibited. Mr. Watson expressed his pleasure at the appreciation shown by all grades of the staff of the facilities which the school provides. An acquaintance with the exact letter of the rules was very good so far as it went, but he thought it better still for every man to have a knowledge of the principles which underlay the rules. By attending the classes a first-hand knowledge was obtained of the results intended to be achieved by the framing of the rules, and a man was thus fitted to form a better judgment in cases of emergency, and to act promptly and effectively. Eighty per cent. of the students who attended the classes during the last session were successful in obtaining certificates of proficiency. That the efforts of the lecturer, Mr. Davies, have been appreciated was demonstrated when Mr. Watson, on behalf of the students, presented him with a gold watch and pendant, suitably inscribed.

* * *

The annual dinner of the staff of the Superintendent of the Line, Lancashire and Yorkshire Railway, was held on Saturday, December 6th, at the Clifton Hotel, Blackpool. The party left Manchester in the early afternoon, and as the

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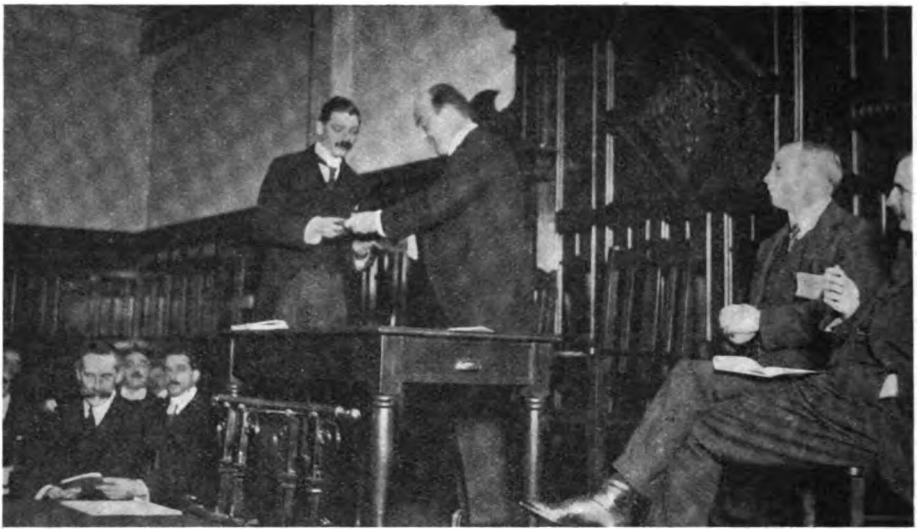


Photo] ["*Daily Sketch.*"

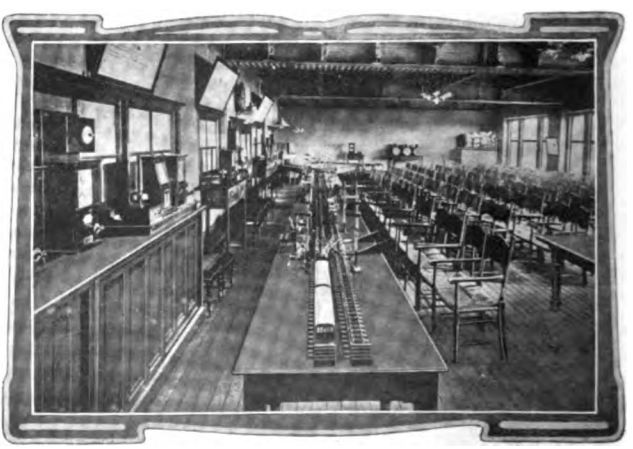
LANCASHIRE AND YORKSHIRE RAILWAY SCHOOL OF SIGNALLING.

Mr. Arthur Watson, Superintendent of Line, presenting a gold watch and pendant to Mr. A. Davies, lecturer, on behalf of the Students.

staff of the Chief Goods Manager were also holding their annual dinner at Blackpool, a football match was arranged between teams selected from the respective Departments, resulting in a victory for the Chief Goods Manager's staff. Those who did not attend the football match found other attractions in the Tower, Winter Gardens, etc. Mr. Arthur Watson (Superintendent of the Line), supported by Messrs. R. C. Irwin (Secretary), J. A. Redford (Chief Cashier), J. Taylor-Jones (Assistant Solicitor), F. W. Attock (Chief Mechanical Engineer's Department), S. Hauxwell (Assistant Superintendent), W. H. Pearson (Chief Clerk), and F. H. Cowell (Eastern District Passenger Superintendent), presided at the dinner over a happy company numbering over one hundred. Complimentary telegrams were exchanged with the staffs of other Departments who were also holding similar functions. The loyal toast having been honoured, Mr. Walter H. Smith ably proposed the toast of the "Lancashire and Yorkshire Railway and its Officers." Mr. Watson, who was received with musical honours, responded and expressed thanks for the very cordial manner in which the toast had been received, and took the opportunity of thanking the staff for the splendid service they had given him during the year. Mr. Hauxwell gave the toast "Our Guests," which was responded to by Mr. J. Taylor-Jones in a racy speech. On the proposition of Mr. F. B. Halliwell, a hearty vote of thanks was accorded the chairman and artistes. Mention should also be made of the very excellent programme provided. Mr. J. E. Nicholson officiated at the piano.

* * *

MR. HUGH W. DRUMMOND, Chairman London and South Western Railway, presided at the first smoking concert of the season, held at the Brunswick Institute, Nine Elms, S.W. During an interval in the excellent programme the Challenge Shield and medals for ambulance work, and also the Challenge Cups and other prizes, were presented to the winners of the respective cricket, football, rifle, swimming club and billiard competitions by the Chairman, who said they were there to congratulate those of their colleagues who had done so well in the field of sport or in First Aid. It was interesting to recall that in the Ambulance Centre, which was



SCHOOL OF SIGNALLING AT VICTORIA STATION, MANCHESTER: LANCASHIRE AND YORKSHIRE RAILWAY.

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started in the year 1900, no fewer than 2,143 of the Company's employés had gained First Aid certificates, and in addition to that 969 held second and third-class examination vouchers and medallions, which was a fine record and one they might well be proud of. The annual competition had been as keen as ever, and the first team to gain the Company's Challenge Shield was the "A" team from Wimbledon. Last year they were second to Southampton, but this year the position was reversed, Wimbledon being first and Southampton Docks "B" a very good second. The third prize went to Richmond and a consolation prize to Eastleigh. He congratulated those teams, and if he had any regret at all it was that the West Country were not in the first three, but he hoped the West Country people would whip them up.

* * *

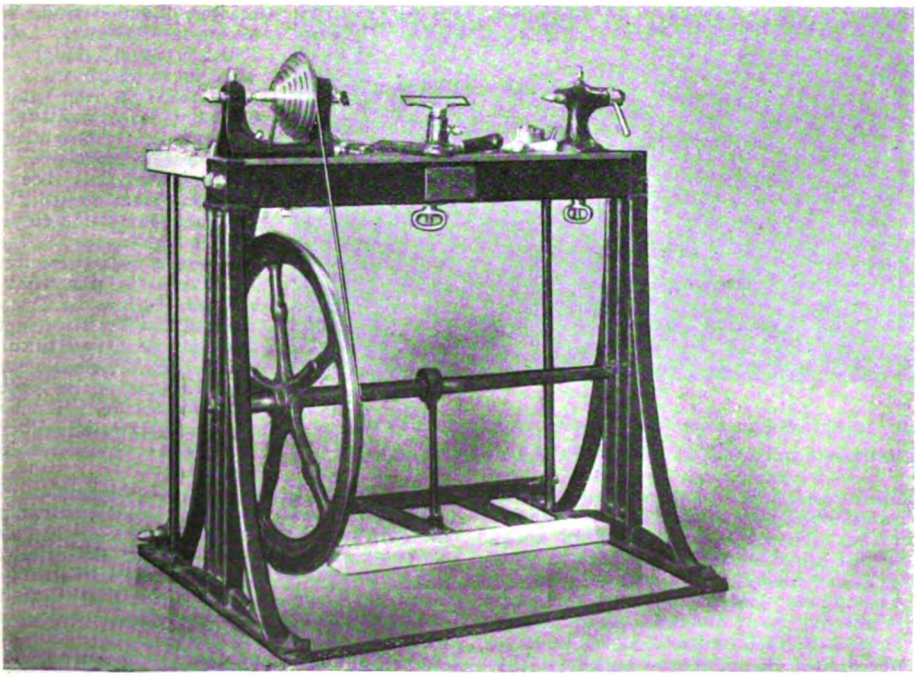
Modern railway carriage construction was the subject of a paper recently read by Mr. W. Beahan, at a meeting of the Great Southern and Western Railway Engineering Association held at Inchicore, Dublin. Mr. Beahan described the various operations necessary in the construction of a modern bogie centre corridor carriage, until it left the carriage shop to be upholstered, the various finishing operations completed, ready for the road. Mr. G. V. Hutchinson, who presided, said the centre corridor carriage was the best class of coach, as it offered great possibilities of making a light vehicle. Modern trains had become enormously heavy, and everything possible should be done to lighten them. He did not agree with the elevated roof, as the extra framing necessary added considerably to the weight of the coach, and the advantage gained was little as compared with the high eliptical roof. The 66 ft. carriages of the Great Southern and Western Railway weighed about 37 tons. He also took exception to the design of the present day coach, and considered that the sides, instead of being curved, should be flat. If this was done, great saving would be effected in both labour and material. He was in favour of having carriages upholstered in leather instead of the material at present used, and he expressed the opinion that a comfortable seat was far more important to the travelling public than elaborate mouldings and photographs, which formed receptacles for dust.

* * *

"Ideal Winter Holiday Resorts," the latest addition to the Great Western Railway's admirable series of traveller's handbooks, has the merit of being helpfully practical. The intending visitor to the Cornish Riviera, Devonshire, Wessex, the Cardigan Bay Coast, and a number of popular Inland Resorts, or he who has yet to decide where the winter holiday shall be spent, is able to come to an easy decision. The book gives him just what he wants—where to go and the best way to get there. Copies may be obtained gratis.

* * *

In the history of the London and South Western Railway Servants' Orphanage, Woking, Saturday, December 6th, 1913, will ever remain a red-letter day by reason of the pleasing function that took place that rainy afternoon, when Mr. Felix Fighiera, Secretary of the Central Argentine Railway, attended in his robes as Master of the



TURNING LATHE PRESENTED TO THE RAILWAY ORPHANAGE, WOKING, BY MR. F. FIGHIERA.

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Photo] [*Elliott & Fry.*

MR. F. FIGHIERA: Secretary, Central Argentine Railway.
In his robes and badge as Master of the Turners' Company.

Worshipful Company of Turners and presented a valuable wood and metal turning lathe for use in the carpenter's shop attached to the Home. Sir Charles Owens, President of the Orphanage, presided, and introduced Mr. Fighiera. There were present among others, Sir Herbert and Lady Bartlett, Messrs. Harold W. Marigold, H. L. C. Howell, A. W. Szlumper, Cecil W. Smith, H. G. Warne and Rev. Price Devereux. In making the presentation, Mr. Fighiera mentioned that the machine before them was the thirty-eighth lathe he had presented to public institutions during his term of office as Master of the Turners' Company. In simple, well-chosen language the Worshipful Master recapitulated to the orphans the noble history of the City Guilds and then proceeded to give the children much good advice as to the ordering of their lives while resident in the institution and after leaving the Home. Mr. Fighiera is an orator of no mean order, and the juveniles and their elders listened spell-bound to his eloquent address, cheering him heartily at its conclusion. In responding to a vote of thanks, Mr. Fighiera referred to the appeal made in the December RAILWAY MAGAZINE on behalf of the children for Christmas contributions to enable the usual festivities to be carried out. He hoped that there would be a generous response and stated both he and his friends who were with him would make donations before leaving. Needless to say his remarks were received with acclamation and the happy faces of the orphans testified their appreciation of the kindness of their new-found friend.

* * *

MR. J. HUNTER, stationmaster, London and North Western Railway, London Road station, Manchester, who is to retire on superannuation at the end of January, is a familiar figure to many thousands of Manchester travellers. Mr. Hunter, who has been at London Road since 1887, will have completed 45 years' service on January 31. He comes of a railway family and his career is somewhat remarkable, for he was a stationmaster at the age of twenty years, and since the death of Mr. Sedgwick, of Victoria station, he has been the doyen of Manchester stationmasters, of whom he remembers no fewer than twenty.

He joined the staff as an apprentice clerk, and in 1872 was promoted to be stationmaster at Kirkby Lonsdale. Six years later he was a district inspector at Lancaster, and afterwards held a similar position at Carlisle. Then he was stationmaster at Penrith and at Carnforth, followed by a period as general inspector over the north of England, being stationed at Crewe. In 1885 he became stationmaster at Longsight. When he came to London Road station two years later the London and North Western Railway had only one up and one down line

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there, and the Great Central had similar facilities. Now the two systems have twelve lines, and, in addition, the London and North Western Railway have the new station at Mayfield, also under Mr. Hunter's control. Some idea of the immense traffic that he has seen grow up in his 26 years at London Road may be gathered from the fact that fully 20,000 passengers per day use the station, while 70 trains go in and out daily at Mayfield, the number of passengers totalling about 10,000. Though he has been three times knocked down on the line while following his duties, Mr. Hunter does not bear a scratch. On two occasions he was caught by light engines, being knocked clear of the metals, but in October, 1911, he was not so fortunate. He was caught between the engine and the platform, and just managed to draw his leg and his arm off the metals in time, but so narrow was the escape that a piece of his coat sleeve was taken off by the engine wheel. An influential committee, with Mr. W. Fox, Mr. Hunter's successor at London Road station, as hon. treasurer, is arranging a suitable testimonial. Mr. Hunter's portrait appeared in the RAILWAY MAGAZINE, March, 1912.

* * *

WHEN, early in December, the special facilities afforded by the Metropolitan Railway for the holiday maker to spend a short time at Christmas in the country near at home in Middlesex, Herts or Bucks, were announced, they were found to be of an unusually comprehensive character and included for Christmas Day and Sunday, 28th December, cheap tickets from all Metropolitan stations. For the day and half-day, by certain trains to Chorley Wood, Chesham, Amersham, Great Missenden, Wendover, Aylesbury, etc. By all trains (up to 5.42 p.m. from Baker Street) to Rayners Lane, Eastcote, Ruislip Manor, Ruislip, Ickenham and Uxbridge, and by trains between 2.0 and 3.48 p.m. from Baker Street to Harrow, and West Harrow, and on Boxing Day and Saturday, 27th December, a special service of trains between Baker Street, Willesden Green, Harrow, Ruislip, Uxbridge, Rickmansworth, Chesham, Wendover, and Aylesbury; day excursion tickets by certain trains to Rickmansworth, Chorley Wood, Chesham, Amersham, Great Missenden, Wendover, Aylesbury, Waddesden, Quainton Road, Wotton, Brill; half-day tickets by the 2.15 p.m. train from Baker Street and by connecting trains from other stations to Pinner, Rickmansworth, Chorley Wood, Chesham, Amersham, Great Missenden, Wendover, Aylesbury, etc., and by 2.24 p.m. train from Baker Street to Harrow and West Harrow; and cheap tickets by all trains from Baker Street up to 5.45 p.m. to Rayners Lane, Eastcote, Ruislip Manor, Ruislip, Ickenham and Uxbridge.

* * *

IN readiness for the opening of the first section of the electrified suburban lines during 1914, a revision of fares has been made by the London and South Western Railway. The revision affects all the suburban stations within 17 miles of Waterloo, and in some important respects every season ticket holder will benefit. For instance, it has been the practice to charge £3 extra to those who desired their season tickets extended from Waterloo to the City by the tube railway, but from January 1 this will be reduced to £2. On all suburban season tickets to Waterloo there will also be reductions, of which the following are examples:—From Surbiton, Kingston, Norbiton, Hampton Wick, Teddington and Strawberry Hill the charges for season tickets were, first-class £18, second-class £13 10s., third-class £10 16s.; the revised fares are respectively £16 10s., £12 15s., and £10 4s. Reductions from other stations include:—Esher, 27s. 6d., 15s., and 12s.; Thames Ditton, 35s., 20s., and 16s.; Hampton Court, 20s., 10s., and 8s.; Richmond, 30s., 15s., and 22s.; Wimbledon, £2 first-class, and only 2s. 6d. and 2s. in second and third. In the case of daily single and return tickets the following are examples:—Kew Bridge to the City, single or return tickets reduced 6d. first-class, 4d. second, 5d. third; to Waterloo the reductions are respectively 5d., 3d., and 3½d. single and 6d., 3d., and 3d. return. Surbiton to the City, 4d., 2d., and 2d. single, no reduction on return; to Waterloo, 4d., 2d., and 2d. single, no reduction on return.

* * *

A NEW series of posters issued by the London Underground Railway for the month of December concentrated attention on the Christmas festivities. The approach of the school holidays made very timely Miss Hilda Cowham's poster entitled "Underground, always ready for any sort of business or pleasure" depicting children entering an Underground booking office. Mr. Tony Sarg's latest poster on the Humours of London, No. 12, entitled "Toyland" draws attention to the season of buying Christmas presents and the busy-ness of the shopping centres. A series of well executed panels showing the best way to the churches, theatres, football grounds and concert halls have now for the past few weeks adorned the fronts of the booking offices in the principal stations. A diagrammatic poster showing the arrangements in operation at the new Paddington station has also provoked a very large amount of public attention.

* * *

IMPROVEMENTS continue at various stations on the Great Western Railway, among which may be mentioned the provision of a down goods loop, capable of containing 100-wagon trains, between Fritwell and Somerton and Aynho; ten additional sidings and two goods loops at West Depôt, Bristol; provision of accommodation for milk traffic at West Ealing; a down loop for local passenger trains at Exminster, the down platform being converted into an island; a central signal box to replace two now existing, and a down goods loop at Princes End; electric capstans and reels for shunting at Gloucester Wharf, Newport; extension of loading platform, additional sidings, a crane road and new delivery office at Morpeth Dock, Birkenhead; two additional sidings at west end of the yard at Acton; a loop mileage siding at Newnham Bridge; new offices at Swansea; a 60-ton truck weighbridge at Tipton Basin; and new engine sheds at Maesglas. Other works are in hand: the provision of up and down loops at Yatton; quadrupling from Pontsarn crossing to Miskin crossing at Llantrisant; additional accommodation for excursion traffic at Weston-super-Mare and the construction of a goods depôt in Lightbody Street, Liverpool.

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TAKING as his subject "Progress in the Means of Transport," Mr. W. A. Paterson, Engineer-in-Chief, Caledonian Railway, gave a useful lecture to the Glasgow Association of Students of the Institution of Civil Engineers. In his reference to railway transport, Mr. Paterson mentioned that on the Caledonian Railway alone there were 50,000 shareholders. In December, 1912, the capital of all the railways in Great Britain was £1,335,000,000. The gross receipts amounted to £128,500,000, and the expenditure to £81,250,000. The total number of passengers carried was 1,294,337,000, and the tonnage of goods and minerals transported amounted to 520,000,000 tons. The receipts on goods traffic came to £63,000,000, leaving a balance of £65,500,000 for passenger traffic. The taxes paid by railways to the Government and to local authorities reached the large total of £5,129,000. The total railway mileage of the world in December, 1911, was 673,303 miles, of which 199,240 miles were State-owned. In the British Empire alone there were 58,407 miles of State-owned railways. The mileage of the railways in Great Britain and Ireland in December, 1912, was 23,447 miles.

* * *

"IMPROVEMENTS in Railway Methods" was the subject of a paper recently read by Mr. E. J. Lewis, of the Midland Railway Goods Manager's office, at a meeting of the Midland Railway Institute. He remarked that owing to the restrictive effect of the gauge and tunnel height, the size of engines, coaches, and goods vehicles could only be increased in width and height up to a certain point, while practical and technical difficulties precluded extension in length beyond a certain point, especially in the case of locomotives. Mr. Lewis dealt with the development of the locomotive, mentioning the compounds of the late Mr. F. W. Webb, of the London and North Western Railway, which were scrapped by Mr. Webb's successor, Mr. G. Whale. The Midland Railway had built a number of three-cylinder compounds, which were highly successful. The compound, however, had been overshadowed by the superheater, which seemed to be in a fair way to general adoption. Having dealt with electric traction, electric signalling, track circuiting and the recently invented Radiophone signalling to moving trains, which the Midland is adopting, Mr. Lewis referred to the "control" system, which enabled the company to increase the working capacity of the line.

* * *

ON December 3, Mr. Henry Curwen, of the Midland Railway's Goods Department, Sheffield, read an instructive paper to the members of the Midland Railway (Derby) Literary and Debating Society. Mr. J. Pepper of the Chief Goods Manager's Department presided. Mr. Curwen's subject was "The Management of a Large Goods Station." Some of his *obiter dicta* are worthy of record. For example: "One of the greatest aids to satisfactory and inexpensive working of goods stations, is a quick reliable train service and I think we on the Midland may claim, as a result of the introduction of the control system, general merchandise is on the whole worked with regularity and dispatch." Again he remarked "The new demurrage regulations have greatly helped in the direction of yard workings. Wagons are not now kept standing under load day after day, not only requiring siding room, but continual shunting. They are unloaded more quickly, making room for others and so make it possible for a larger tonnage of traffic to be dealt with than formerly."

* * *

A NUMBER of important official changes among the chief officers of the London and North Western Railway have lately taken effect or are announced for the new year. Sir Frank Ree will continue as General Manager for a short period, after which he will join the Board of Directors, being succeeded by Mr. Guy Calthrop, who is returning from the Argentine as already arranged. Mr. C. E. Grasemann, whose retirement owing to ill-health has been expected for some time—we regret to hear, as we go to press, of his death—is succeeded as Chief Goods Manager by Mr. I. T. Williams. Mr. Cumberland Lowndes becomes Chief Outdoor Goods Manager, Mr. W. A. Ree taking his place as Outdoor Goods Manager for the Southern Division, Mr. L. A. P. Warner following Mr. Ree in charge of the Northern Division. Of the district officers Mr. G. T. Phizackerley takes Mr. L. A. P. Warner's place as District Goods Manager at Liverpool, and is succeeded as District Traffic Superintendent at Chester by Mr. H. Thompson from Swansea, who is followed by Mr. E. W. Guest. The retirement of Mr. J. G. Humphreys, District Goods Manager at Birmingham is referred to on another page, but we are not yet in a position to name his successor.

* * *

FOR several years past the calendars issued by the "Underground" electric railways have been characterised by a series of impressionist views appropriate to the respective months. For 1914 the "Tony Sarg" posters are drawn upon, with decidedly satisfactory results. With a touch of humour in each and including the peculiar characteristics associated with this artist, this calendar is likely to meet with general favour.

* * *

ESTABLISHED in 1861, the United Kingdom Railway Officers' and Servants' Associations, has expended nearly £60,000 in annuities, over £100,000 in rendering assistance in times of sickness, some £60,000 to widows and dependents on the death of members, and about £15,000 for the benefit of orphans or as special grants. Assistance is, however, required to amplify subscriptions and other sources of income, and the secretary, Mr. Alfred James, will be pleased to supply further particulars and to receive donations at the offices of the Association, 21, Finsbury Pavement, London, E.C.

* * *

AT the meeting of the Railway Club, on Tuesday, December 9th, Mr. H. L. Hopwood described a selection of lantern slides collected since the formation of the Society in 1899, a very pleasant evening being spent. The Annual Dinner at the Holborn Restaurant, on Friday, December 12th, was very successful in every way. Mr. W. Parker occupied the chair. Following the Annual General Meeting on Tuesday, January 13th, 1914, Mr. M. G. S. Blane will read a paper on "The Light Railways of France," illustrated by lantern views.

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NEW STATION OPENED AT WEST HARROW: METROPOLITAN RAILWAY.

A NEW station on the Metropolitan Railway between Harrow and Rayner's Lane on the Uxbridge Branch, to be known as West Harrow, was recently opened which will prove a great boon to the population in the neighbourhood of the Bessborough Estate. Season tickets from Harrow-on-the-Hill are available from the new West Harrow station which is one and a half minutes further. All trains from Uxbridge and Harrow call at the new station and there are a good number of through trains to and from the City.

* * *

BUILT at Crewe, the latest 4–6–0 ("Prince of Wales") London and North Western passenger engines (Schmidt superheater) are Nos. 2040 *Oliver Goldsmith* 2075 *Robert Burns*, 2198 *John Ruskin*, 2205 *Thomas Moore* and 2213 *Charles Kingsley*. These engines complete the series referred to in the last December RAILWAY MAGAZINE. A further series of the same type is also in course of construction. No. 1419 *Tamerlane* ("Precursor" class) has been altered to a superheater and fitted with piston valves. No. 1734, 4–6–2 tank, has also been superheated. Including No. 2500, which was recently done, there are now about sixty 2–4–2 tanks fitted up for motor service. There are also five of the 2–4–0 type similarly fitted. No. 1679 *Bunsen* (6 ft. 6 in. Jumbo) has been broken up, and also several 4-cylinder compound goods engines (1400 class).

* * *

SEVERAL Midland 0–6–4 tank engines are now working on the London, Tilbury and Southend section to amplify the original stock of that company, the 4–6–4 tank having been, we understand, withdrawn even from the Ealing-Southend trains and goods traffic. The Midland engines take some of the expresses, usually running bunker first so as to have the bogie leading.

* * *

MR. EDWARD WELLS, formerly a member of the firm of Messrs. Gane, Jackson, Jefferys, Wells and Co., chartered accountants, Coleman Street, London, E.C., has been appointed Joint Chief Accountant to the Great Western Railway in association with Mr. G. J. Whitelaw. Born in 1862, Mr. Wells began business training in 1878. In 1884 he entered the office of the above mentioned firm of chartered accountants. In 1896 he became a partner. Admitted a fellow of the Institute of Chartered Accountants in 1901 he went in the following year to Brazil to re-organise the accounts of the Great Western Railway of Brazil which had just then linked up with its own a number of lines leased from the Brazilian Government. At the beginning of 1913 he went again to Brazil re-organising railway accounts and undertaking other enterprises. On his return he accepted his present appointment at Paddington.

* * *

MR. W. F. JACKSON, General Manager, North British Railway, has been appointed Chairman of the Burntisland Harbour Board for the year 1914. Mr. Jackson commenced his long experience with the North British Railway in 1877 and became General Manager in 1899. He was Chairman of the Railway Clearing House General Managers' Conference for the year 1908.

* * *

IN view of the retirement under the age limit of Mr. J. Warriner, Outdoor Assistant Goods Manager, the Directors of the Midland Railway have appointed two Outdoor Divisional Assistants to the Chief Goods Manager. Mr. B. Varley will take the Southern Division, which is south and west of Derby, and Mr. H. F. Loney will take the Northern section, which includes Derby, Nottingham, and the Newark and Lincoln Line. The appointments date from January 1, 1914.

* * *

ONE of the best known passenger guards in Scotland, Mr. Duncan Kennedy, has recently retired from the North British Railway. He had 45 years' service to his credit, 38 of which were spent in the before-mentioned capacity. His fellow employés marked their appreciation of the merits of their old comrade by presenting him with a gold watch and a purse of sovereigns.

* * *

FOR the widening of the portion of the Chester and Holyhead line between Abergele and Llandulas a contract has recently been let by the London and North Western Railway. It is expected that the entire length of the widening, two and a half miles, will be finished by June next in readiness for the heavy summer holiday traffic to the North Wales resorts.

* * *

AN illustrated pamphlet has been published containing a full account of the Channel Tunnel scheme, as it is now being considered by the Committee of Imperial Defence. Special articles have been contributed by Lord Sydenham, formerly Secretary of that body, as also by other well-known authorities, and particular attention is devoted to the questions of national defence and food supply. Baron Emile d'Erlanger, Chairman of the Channel Tunnel Company, deals exhaustively with the military, financial, and commercial aspects of the scheme, and Sir Francis Fox with its engineering details. The memorandum which Lord Wolseley presented to the Joint Select Committee of 1883 is reproduced, together with the papers prepared at the same period by Major-General Sir Andrew Clarke, General Sir John Adye, and General Sir Patrick McDougal. A pamphlet by Mr. Arthur Fell, M.P., is reprinted with verbatim reports of the deputation which that gentleman introduced to the Prime Minister

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CENTRAL ARGENTINE RAILWAY CALENDAR FOR 1914.

in August last; of the proceedings of the Franco-British Travel Union Conference, in so far as they related to the proposed submarine railway between England and France; and of other meetings at which the same subject was considered. Translations appear of the articles in the *Revue des Deux Mondes*, by M. Albert Sartiaux, and *Je Sais Tout*, by Dr. J. Crinon, and the book, which is the most comprehensive ever issued by the Channel Tunnel Company, extends to 136 pages.

* * *

For winter sports, the Paris, Lyons and Mediterranean Railway has, in conjunction with the South Eastern and Chatham, London, Brighton and South Coast, Northern of France and French State Railways, made arrangements for the season as follows:—To Chamonix, the great centre for all sports at the foot of Mont Blanc, cheap tickets are issued on Fridays and Saturdays to March 1st, available 20 days between London and Paris and 15 days beyond. On the same days, to March 1st, tickets will be issued to Mont Revard at still lower figures. Mont Revard has a ski-ing field 13 miles by 4 miles. Hotel accommodation of the greatest comfort is to be found at Chamonix and Aix-les-Bains—Mont Revard has a chalet-hotel with 40 beds, and is very convenient for sportsmen, and a good restaurant service is organized for people staying at Chambéry and Aix-les-Bains.

* * *

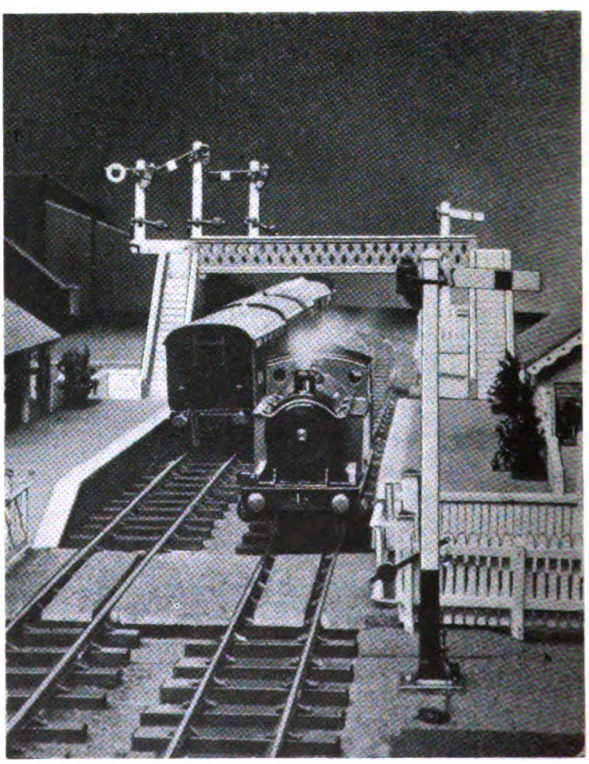
First of the calendars for 1914 to arrive at the Railway Magazine offices was the original of the Central Argentine Railway's artistic production, illustrated on this page. In size about 21 by 15 inches, it depicts the Company's fine new terminus at Retiro, an express passenger train drawn by one of the latest "Pacific" type locomotives and the Sierras Hotel at Alta Guacia. Printed in Spanish, the calendar, which is of the tear-off type, gives useful information concerning the services of the Central Argentine.

* * *

Designed by Miss Prytherch, daughter of the Indoor Assistant of the Superintendent of the Line, the Great Eastern Railway Christmas Programme for 1913 presented a particularly seasonable and appropriate appearance, the predominant feature being an artistic portrayal of a healthy sprig of good old-fashioned well-berried holly. Miss Prytherch is making quite a name as a designer of holiday programme covers.

* * *

Illustrated on this page is a very fine British built model railway, recently exhibited at Bristol where it was much admired for its accuracy and finish. The builders, Messrs. Bassett-Lowke, Ltd., Northampton, have just issued a new catalogue and will be pleased to receive applications for copies from Railway Magazine readers.



MODEL RAILWAY BUILT BY MESSRS. BASSETT-LOWKE, LTD.

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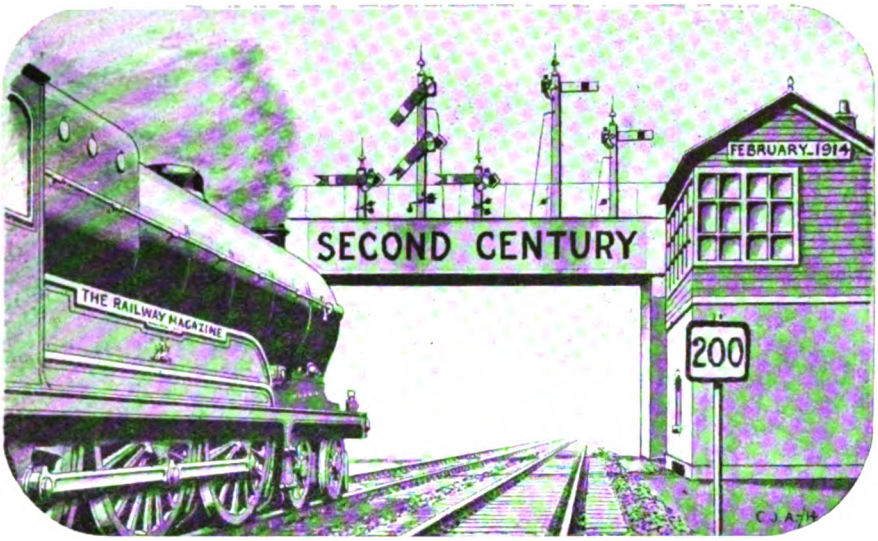

Our 200th Number.

FOR the second time in its history the RAILWAY MAGAZINE is presented to its world-wide circle of readers in the guise of a century number. Eight years and four months after its inception in July, 1897, the record of progress achieved in October, 1905, falsified the suggestions made at the time of publication of the initial issues that the available subject matter would be exhausted in three or four years; and the corresponding period now added to the history of the RAILWAY MAGAZINE has entirely substantiated the argument that while the world's railways continue to improve and develop there will always be more than sufficient material to enable the original objective to be adequately fulfilled.

With extreme pleasure due acknowledgment is made of the numerous congratulatory communications received before and after announcement of the special character of the 200th issue was made. To all such correspondents—railway officers, engineers, professional men and general readers—sincere thanks are tendered for so many kind and appreciative comments upon the fact that the RAILWAY MAGAZINE is passing its 200th milepost "full steam ahead."

It is likewise necessary to supplement the thanks due to general readers, annual subscribers and advertisers for their valued recognition of the merits of the magazine by hearty acknowledgment of the continued courtesy and co-operation the publication and its contributors receive from leading railway officers throughout the world. Their active assistance makes it possible, month by month, to present the railway service and the large and ever-growing public interested in railway matters with an up-to-date, reliable and attractive record of railway and locomotive activity, well presented and profusely illustrated.

With so many enthusiastic friends and ardent well-wishers, the management anticipate for the magazine a still more useful and prosperous career in the period that lies between the present 200th issue and the publication of the 300th number in June, 1922.

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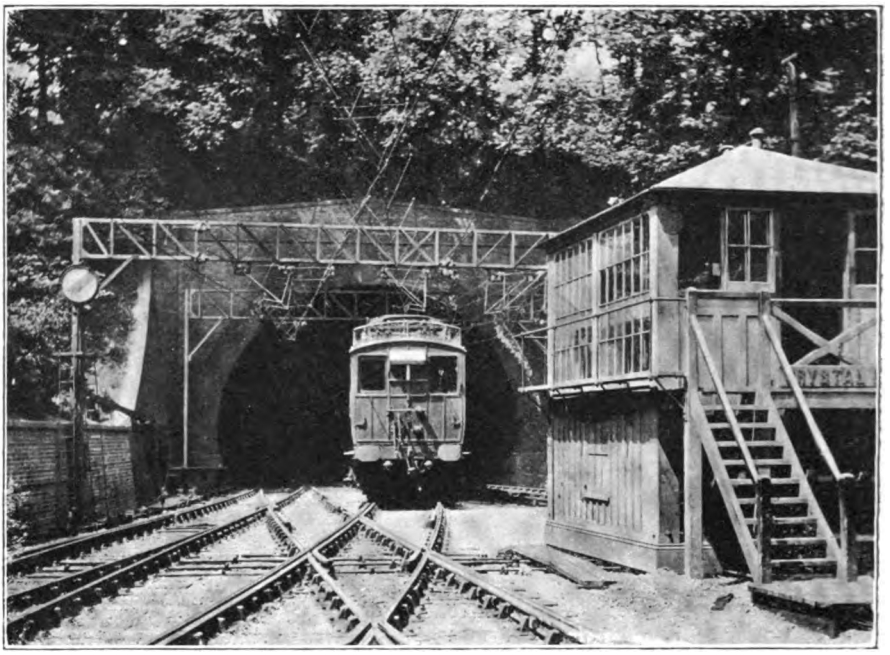

LONDON, BRIGHTON AND SOUTH COAST RAILWAY:
Electric train emerging from Crystal Palace Tunnel.

British Railways: 1905-1914.

By THE EDITOR.

THE relative shortness of the period which has elapsed since the "Century" number of the RAILWAY MAGAZINE was published in October, 1905, combined with the advanced position which had then been reached by the home railways, accounts for the fact that only a few radical changes or developments of a more or less revolutionary character have to be recorded in this and succeeding articles. But every year, indeed every month, has produced alterations and improvements, and the cumulative effect of eight years and a few months realises in the aggregate a very considerable influence in the direction of change and development; so that there is actually a wide range of subject matter calling for review, though space cannot be afforded for detail consideration of all factors.

A large number of changes in respect of boards of directors and chief officers have occurred during recent years, but only a few can be referred to. Death has created several vacancies, and we may mention in this connection Lord Stalbridge, Sir Charles Scotter, Sir Henry Oakley, Sir William Birt, Mr. Vincent Hill, and Sir James Inglis, besides others whose names have been associated with more or less historic developments and proceedings in the railway world. On the other hand, we have to record the continued activity of Lord Claud Hamilton, Sir Alexander Henderson, Sir George Armytage, Lord Allerton, the Duke of Devonshire, Mr. Patrick T. Caird, Sir William Goulding, Mr. Cosmo Bonsor, Mr. Tonman Mosley, Sir David Stewart and other gentlemen who still occupy the positions of Chairmen of their respective companies. On the Midland, Sir Ernest Paget has retired from the Chairmanship, but not from the Directorate, and the same applies to Lord Cottesloe, on the London, Brighton and South Coast, while on the Highland, Mr. William Whitelaw has exchanged positions with Mr. R. M. Wilson, previously Deputy-Chairman, and has succeeded the Earl of Dalkeith as Chairman of the North British Railway Company. Several other changes of interest could be referred to, and we may mention the houourable work already associated with Chairmen of later

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appointment, such as Sir Gilbert Claughton, Viscount Churchill, Mr. H. W. Drummond, Mr. H. Murray Smith and Lord Bessborough; but the foregoing remarks will serve to indicate that the period under review has produced many alterations among Boards of Directors. In a few instances the change is one of name only, as in the case of Lord Aberconway on the Metropolitan Railway, while certain vacancies have been created by special conditions, such as the appointment of Sir George Gibb as President of the Road Board. Railway amalgamations and reorganisations, particularly those affecting the railways now controlled by the Underground Electric Railways Company of London, Limited, and the absorptions of the Lancashire, Derbyshire and East Coast Railway by the Great Central Company, and of the London, Tilbury and Southend Railway by the Midland Company, and reconstitutions and new arrangements associated with the Stratford-upon-Avon and Midland Junction, Isle of Wight Central and other systems, have also been responsible for changes in railway *personnel*.

Of the General Managers of 1905, Sir Sam Fay, Messrs. Alfred Aslett, David Cooper, J. A. F. Aspinall, W. F. Jackson, W. Forbes, E. Watkin, Ammon Beasley, W. D. Phillipps, A. G. Reid, and other gentlemen are still in active service; while among the newcomers—in most cases their names are already well known and deservedly honoured—are Sir Frank Ree (his successor, Mr. Guy Calthrop, has in the interim served as General Manager of the Caledonian Company before going to the Argentine, from whence his return is shortly expected), Mr. H. A. Walker, Mr. Frank Potter, Mr. W. H. Hyde, Messrs. F. H. and C. H. Dent, Sir A. Kaye Butterworth, Sir Guy Granet, Mr. R. Park, Mr. T. H. Rendell, Mr. C. S. Dennies (transferred from the Cambrian to the Cardiff), Mr. J. Williamson, Mr. J. H. Selbie, Mr. A. H. Stanley, Mr. J. Bagwell, Mr. E. A. Neale, Mr. M. F. Keogh, Mr. G. Davidson and Mr. J. H. Vickery. Among the late General Managers who now enjoy honoured retirement—in several instances they are now on their own or other boards of directors—are Sir Charles Owens, Mr. J. F. S. Gooday, Mr. Joseph Tatlow, Sir Frederick Harrison, and Col. Plews, while Mr. Oliver Bury has retired

LONDON, BRIGHTON AND SOUTH COAST RAILWAY:
The circulating area in the new Victoria Station, London.

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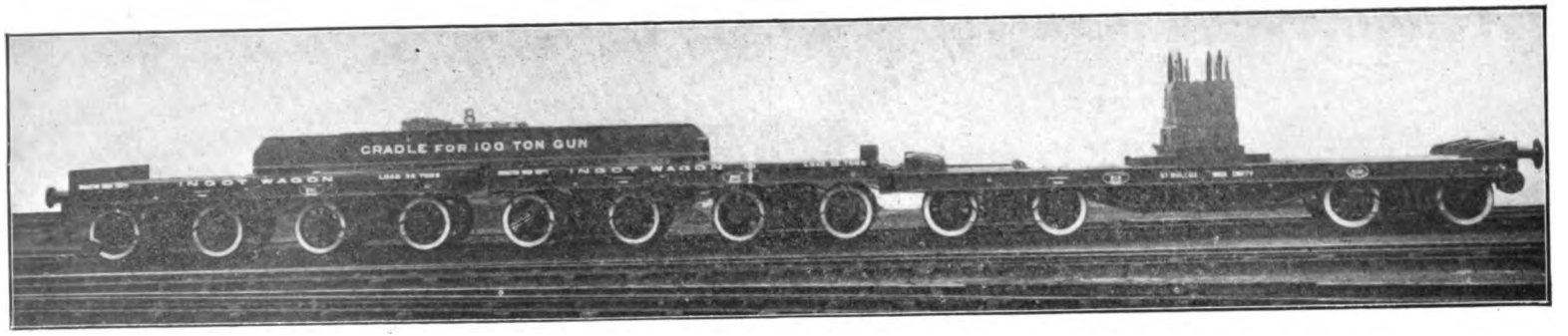
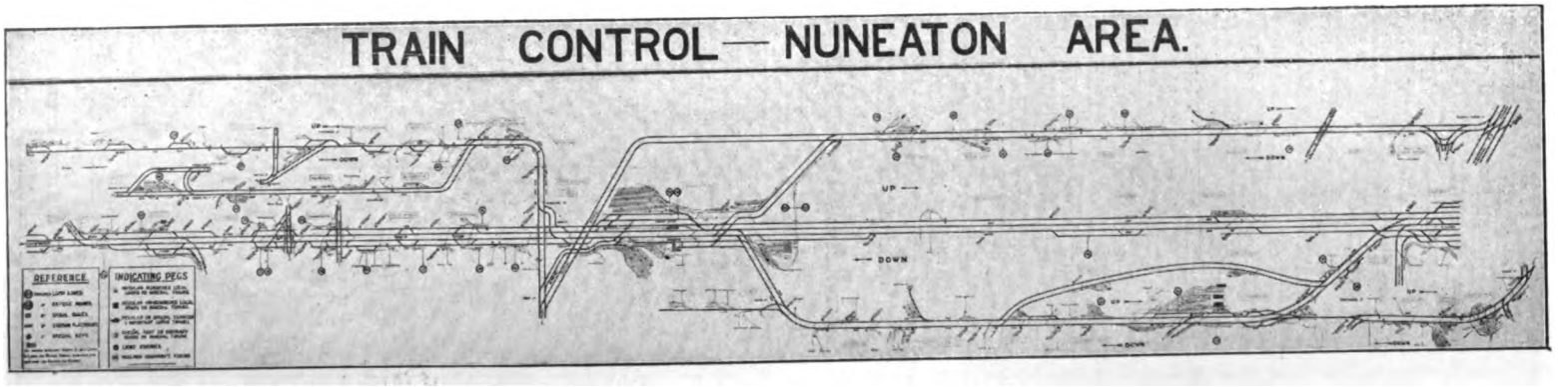


WAGONS FOR CONVEYING 100-TON GUNS: CALEDONIAN RAILWAY.

The above illustration shows a combination of wagons recently constructed at the St. Rollox Works of the Caledonian Railway for carrying 100-ton guns. Two 35-ton ingot wagons are fitted with a cradle, which rests on both wagons, and a 35-ton trolley wagon is also fitted with a cradle to carry the muzzle of the gun. These wagons are of short-wheel base and can negotiate 1½-chain radius curves. The cradles can be taken off and the wagons turned into ordinary traffic when not required for carrying guns, and can be fitted with the cradles again in a few hours.



A MODERN DEVELOPMENT IN TRAFFIC OPERATION.

Train Control Diagram: London and North Western Railway.

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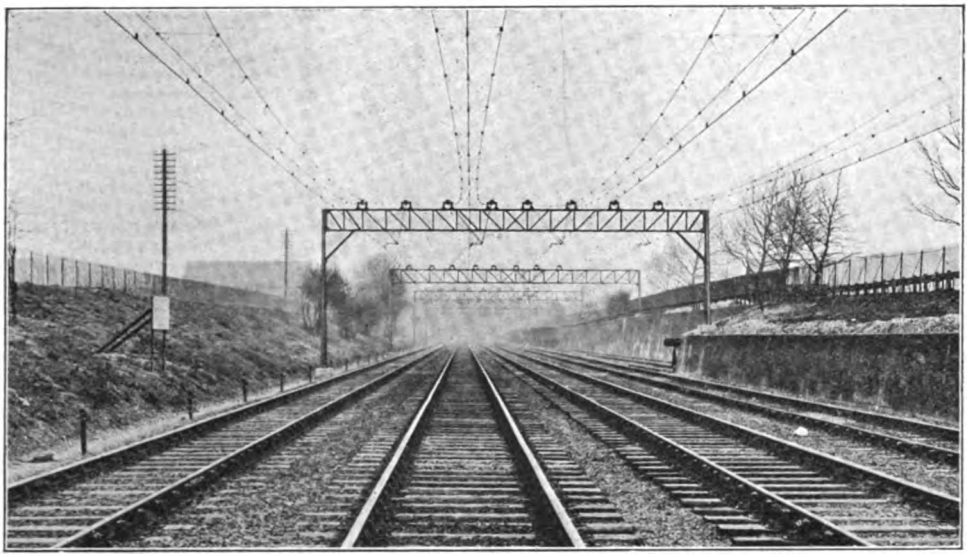
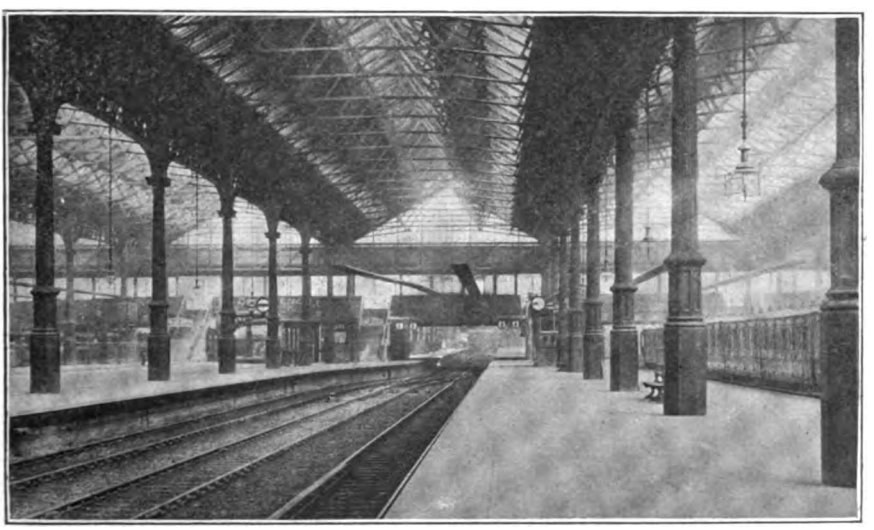


LONDON, BRIGHTON AND SOUTH COAST RAILWAY :
Four track electrical equipment.

from the Great Northern Railway to take the General Managership of the Peruvian Corporation. In the case of Mr. Vincent Hill we have to record his retirement, appointment to the board of the South Eastern Company, and his recent decease.

Many of the secretaries, goods managers, civil engineers, mechanical engineers, superintendents of the line and chief traffic officers, and others in office in 1905 still occupy their respective positions; but space will not permit of detailed reference. We may, however, acknowledge their long service and their continued good work in their respective spheres of railway activity; while many of the gentlemen who have retired during recent years have had long and honourable records, and the same may be said of certain other gentlemen whose retirement is only now announced or is likely to



LONDON, BRIGHTON AND SOUTH COAST RAILWAY :
A view in the new Victoria Station, London.

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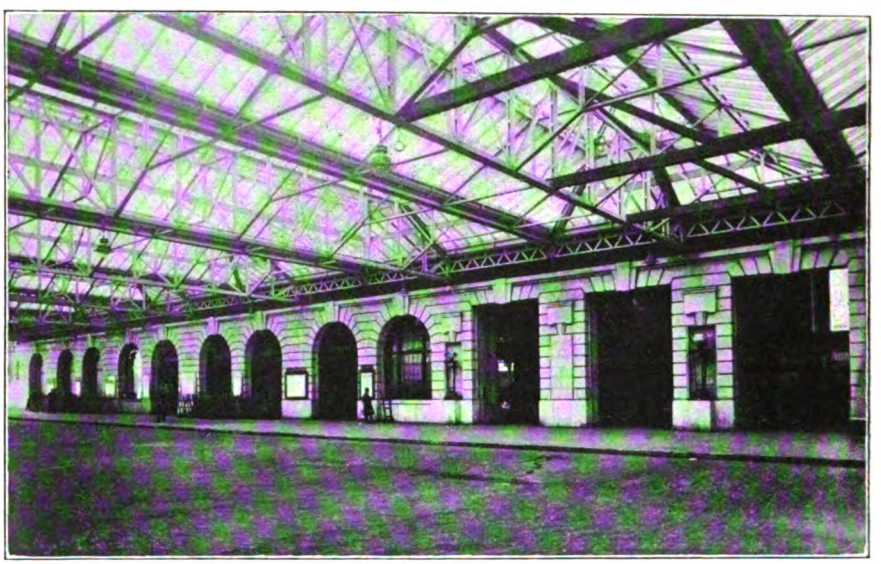
occur shortly. As for their successors, many have already much good work to their credit, and for those still in the prime of life and ripe for years of active service, both present and future offer manifold opportunities.

It is now necessary to refer briefly to organisation and matters of policy, in which respect the past few years have created important changes. In regard to improved and altered organisation the Midland Company provides the principal example; but the North Eastern, Lancashire and Yorkshire, Great Northern, Caledonian and other railways have also proceeded to some extent in the same or corresponding directions. Agreements between companies have the view that competition may not always be advantageous, and that co-operation is often more beneficial for all concerned if adopted to a reasonable degree and on a suitable basis.

The train control system of conducting goods and mineral traffic is essentially a product of later years, though on the Midland it has now a somewhat lengthy record. In conjunction with special telephone installations and other methods of systemising what is ordinarily a variable and relatively uncertain class of traffic, great improvements in train loading, economic use of engines and wagons, and expedition of transit have been realised. The



Photo] [*Topical.*

LONDON AND SOUTH WESTERN RAILWAY:
Courtyard in the new portion of Waterloo Station.

also introduced important differences between the traffic conditions which applied in 1905 and those now in operation. Competition has, in fact, become a secondary consideration, though it still applies to some extent in respect of facilities, quality of accommodation, and traffic arrangements and conveniences. Agreements and arrangements have in fact enabled traffic to be conducted more conveniently and economically (as compared with what it might have been otherwise, in view of the inevitable developments produced by time), but both the traveller and the trader have benefited rather than suffered thereby; and the whole situation supports

Control System is principally exemplified now on the Midland, Lancashire and Yorkshire, London and North Western, North British, Barry and Rhymney Railway, and partially on certain other lines. The new Railway Accounts and Returns Act must also be referred to, by virtue of the special character of the statistical information now called for, and the replacement of the usual half-yearly reports by annual ones. This has also brought the Scottish companies into line with English and Irish railways in respect of reckoning the financial year from January 1 to December 31. We may also mention incidentally the fact that certain increases in rates and fares have been legalised, new

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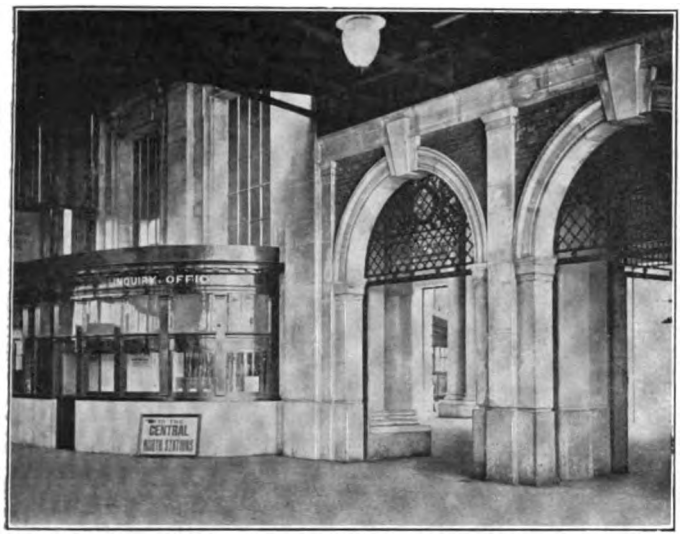

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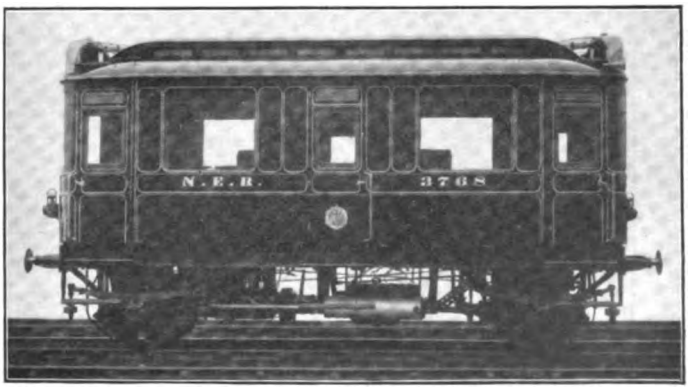
LONDON AND SOUTH WESTERN RAILWAY:
Station architecture at Waterloo.

arrangements have been introduced in reference to demurrage of wagons, while the use of dumb-buffered vehicles is now prohibited.

Another feature of modern organisation, though as a side issue, seeing that it relates primarily to the railway service rather than to actual railway operation, is the introduction of Conciliation Boards. Constituted in consequence of difficulties with the staff, this movement has attained a reasonable degree of success; though opinions may differ as to whether it has done all that was expected of it. The National Insurance Act has necessarily modified many of the railway companies' arrangements in respect of provident societies, and similar associations for the benefit of the salaried and wages staffs.

It is now essential to consider the development of the railways as such. This phase is largely covered by succeeding articles, so that brief reference only is called for here. Several railways have contructed new lines, the most notable being the shorter main routes of the Great Western Company: to the West of England, to Birmingham and the North, between West and North *viâ* Birmingham, and in South Wales (still in progress), besides a few branches and alternative or connecting lines. The opening of the Fishguard-Rosslare route to Ireland and developments in association with trans-Atlantic and other steamer traffic possess more than ordinary interest. The London and North Western Company's new lines in the London area may also be mentioned, while Great Central enterprise at Immingham ranks as one of the most notable developments of the period. Other improvements of this class are covered by succeeding contributions, and need not be further mentioned, except to remark that in the aggregate they provide an interesting record of detail development, though they may be devoid of epoch-marking characteristics.

Several railways have now lost their independence, as in the case of the Lancashire, Derbyshire and East Coast, taken over by the Great Central; the London, Tilbury and Southend, absorbed by the Midland; the Great Northern and City, acquired by the Metropolitan; and the Central London and City and South London, now associated with the Underground Electric Railways Company of London, Limited. On the other hand, we have the Mansfield and Derwent Valley Railways as new ventures, the



PETROL INSPECTION CAR FOR OFFICIAL USE: NORTH EASTERN RAILWAY.

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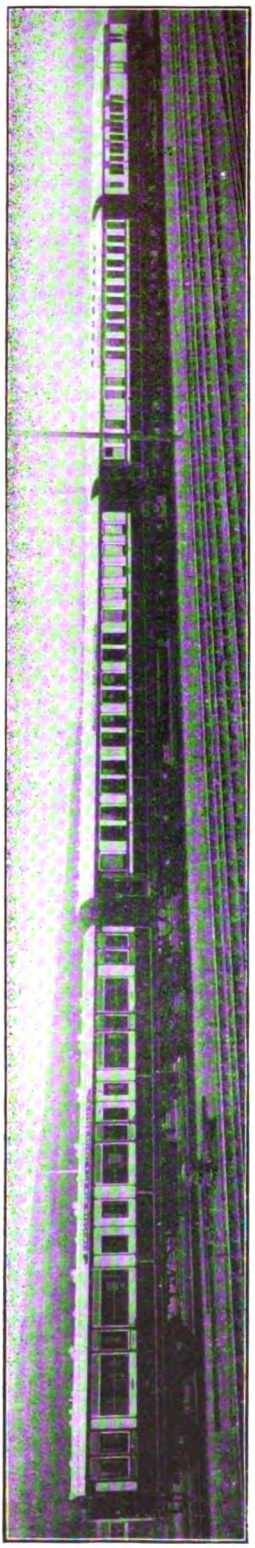

L.N.W.R.

Photo]

"CITY TO CITY" EXPRESS: LONDON AND NORTH WESTERN RAILWAY.

This train, which runs between Wolverhampton and Birmingham and Broad Street station in London, constituted a notable development, in that it serves the business section of the City of London; the train was also the first to include in its equipment a typewriting office and a skilled operator.

Shropshire and Montgomeryshire and other light railways as revivals of old lines or additions to light railway mileage, the Freshwater, Newport and Yarmouth Railway as an example of newly-attained independence, and various new branches and sections promoted by private companies but worked by one or other of the large companies.

It is, perhaps, in reference to electric traction that change is most remarkable. In October, 1905, the City and South London, Central London, Liverpool Overhead, and Waterloo and City Railways had already a number of years' working to their credit, while the Great Northern and City had been opened the previous year. In 1904 also the North Eastern and Lancashire and Yorkshire Companies had inaugurated their electric traction equipments, though developments of later date are now included. It was not, however, until the closing months of 1905 and the early portion of 1906 that the electrification of the Metropolitan and Metropolitan District Railways was virtually completed; and the wonderful changes which have since occurred on both sections; the abolition of steam traction, except beyond Harrow in the one case, and entirely in the other; the introduction and extension of power and automatic signalling (Westinghouse electric-pneumatic and all-electric); introduction of steel and special rolling stock; improvement and reconstruction of stations; and general acceleration and development of train services and facilities, will be well known to all readers and need not be elaborated. In 1906 the Baker Street and Waterloo "tube" was opened, shortly followed by the Great Northern, Piccadilly and Brompton and Charing Cross, Euston and Hampstead lines. Improvements and developments of various kinds on and in connection with virtually all the electric lines in London characterised the period under review; while the coming of the escalator is a matter of more than ordinary moment. We have also to record the inauguration of high-tension alternating current traction on the Midland Railway to Heysham and Morecambe, and on a much larger and comprehensive scale on the suburban lines of the London, Brighton and South Coast Railway. Combined with electrification of the Mersey and East London Railways, electric working to Barking, London, Tilbury and Southend Railway, and the works now in hand on the London and North Western and London and South Western Railways, the record is, indeed, a notable one in this connection.

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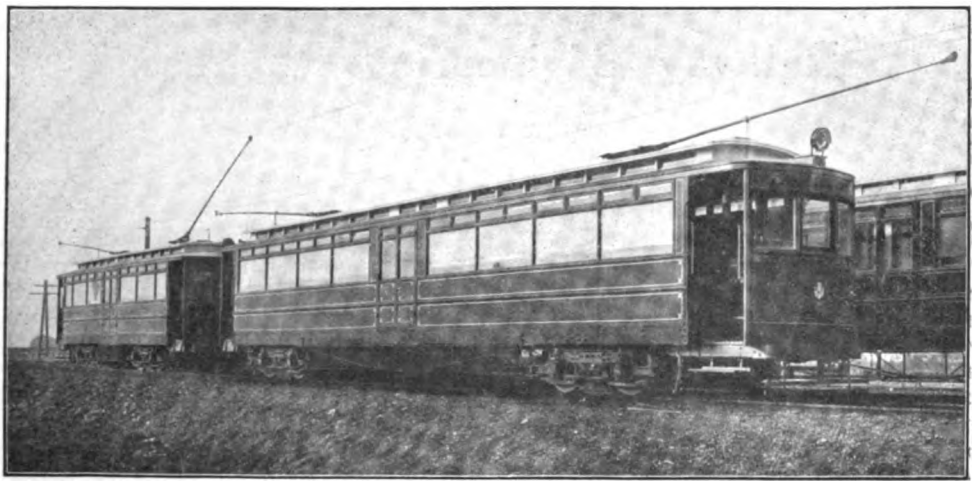
Power signalling was not unknown when No. 100 of the RAILWAY MAGAZINE was published, but its principal developments, power and automatic, relate to later years, and particular mention may be made of the work done by the McKenzie, Holland and Westinghouse Power Signal Co., Ltd., the British. Pneumatic Railway Signal Co., Ltd., Messrs. Siemens Bros. & Co., Ltd., Messrs. W. R. Sykes Interlocking Signal Co., Ltd., and other firms, though it is unnecessary to specify details. Improvements in signalling instruments, development of track circuiting, the extended use of train describers, cab-signalling and other special features are also mainly developments of the period under review.

Locomotives, rol'ing stock, engineering, steamer and dock and other special phases of development are largely covered by other contributions, so that they do not need consideration here ; but we may conclude by expressing the view that the record of progress which has characterised the pages of the RAILWAY MAGAZINE from No. 100 to No. 200 is no mean one, there is abundant evidence that our railways have progressed to a considerable degree, and whether the future will provide for nationalisation, or will continue to witness enterprising private management and progress, the railways of the United Kingdom will compare favourably with railway organisations in other countries, at least on equal terms, and usually they must be rated superior thereto so far as comparison is reasonable or called for.

Reference may also be made to the progress of railways in the colonies and in countries such as the South American Republics, where British interests are so largely concerned. In fact, it is difficult to estimate the importance of railway development, the record of recent years being so notable that the prospects of the future cannot be measured. Suffice it to say, then, that in nearly every case there have been notable extensions to the railways and important improvements in other ways ; while British firms supplying locomotives, rolling stock, engineering material, signalling apparatus and details, and appliances of all kinds have found therein a favourable ground for creating and developing a large supply business, the railways themselves profiting by all-round progress. Various articles have appeared in the RAILWAY MAGAZINE dealing with this phase of railway activity, and others will constitute important features of succeeding issues.



CARS IN USE ON THE GRIMSBY AND DISTRICT LIGHT RAILWAY : GREAT CENTRAL RAILWAY.

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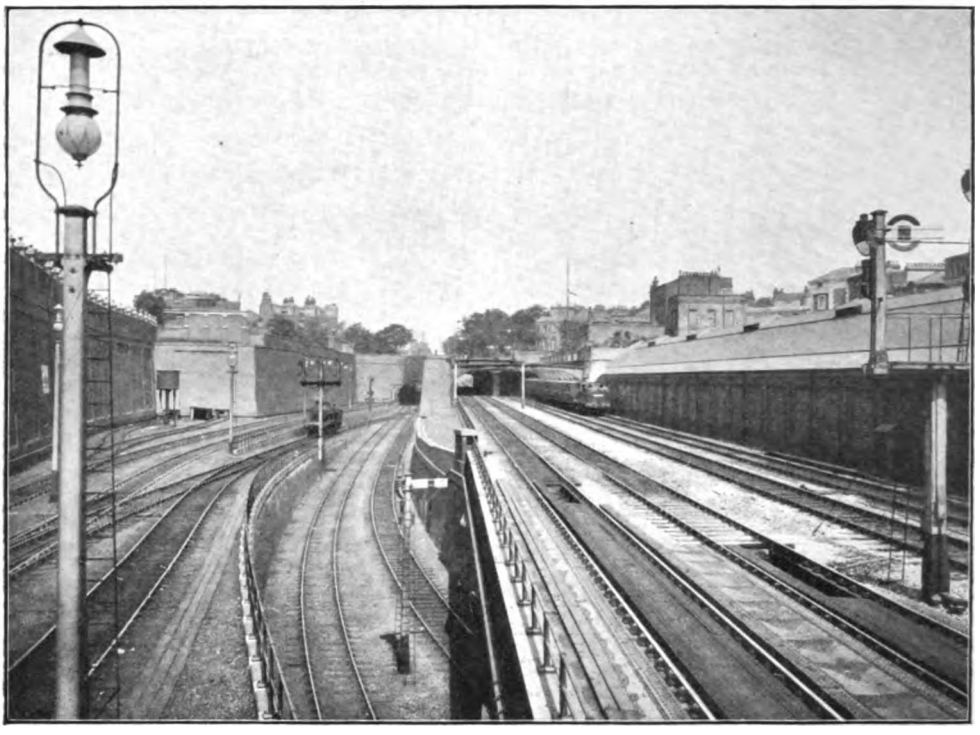

Photo] [*L. & N.W.R.*

AN EXAMPLE OF THE ENGINEERING WORKS INVOLVED BY THE EUSTON-CHALK FARM WIDENINGS AND IMPROVEMENTS: LONDON AND NORTH WESTERN RAILWAY.

Railway Engineering Progress.

By T. PRESTON.

AT first sight it may appear that the home railway system had attained so advanced a stage of development in 1905 that subsequent improvements could only be of a detail and relatively secondary character. Actually, however, during the past eight years many important new lines, widenings, bridges, signalling installations, etc., have been laid down, and the record is relatively comprehensive and interesting.

The year 1906 was remarkable for several notable developments. On July 10th the North Eastern Railway's new bridge over the River Tyne at Newcastle, was opened, the ceremony being performed by the late King Edward VII., and the bridge thus being called "King Edward Bridge." Although accounts were given at the time, it may be stated that the new bridge was commenced in July, 1902, and so took just about four years to build. It was designed by Mr. Charles A. Harrison, Engineer of the Northern Division of the North Eastern Railway, and consists of four steel girders carried on masonry piers, together with viaducts at the approach ends. The two centre girders are of 300 ft. span, and the bridge carries four lines of way, compared with three on Stephenson's old High Level Bridge.

The opening of the King Edward Bridge has had far-reaching effects on the working of the East Coast expresses through Newcastle. Formerly, north-bound trains crossed the Tyne by the High Level Bridge and entered the station at the north end; another engine had then to be attached to the rear of the train in order to proceed towards Edinburgh. The same procedure was followed in reverse in the case of south-bound trains; in fact, Newcastle was a

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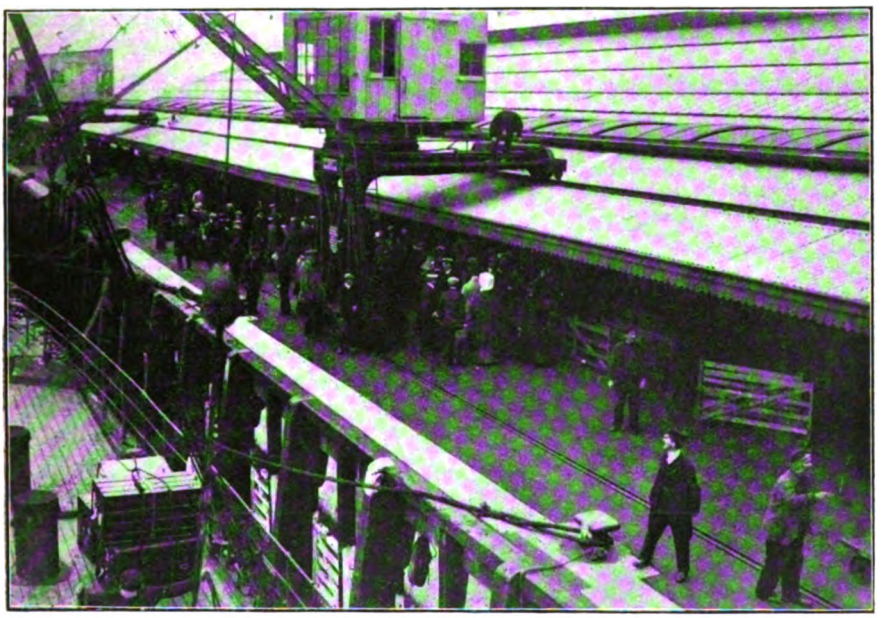
terminal station as regards Scottish traffic. Use of the new bridge has enabled trains to enter and leave the station at the south end, thus converting it into a "through" station like York or Crewe, and enormously facilitating the working of the East Coast trains.

Simultaneously with the opening of the bridge, work was commenced on new electro-pneumatic signal-boxes, Westinghouse system. These have been so fully described already, that there is no need to give a long description of them, but it may be mentioned that Newcastle No. 3 Box, at the Newcastle end of the new bridge, contains 211 levers. The year 1906 was also notable as regards ways during 1906, and indeed during many succeeding years. By the middle of January the Metropolitan District Railway was automatically signalled with Westinghouse electro-pneumatic apparatus from South Kensington to Mansion House, and a month later it was extended to Minories Junction.

Coming to the work done by the other railways in this year, the Great Central Railway opened their new Neasden to South Harrow line on March 1st, and the London and South Western Railway on June 1st opened the single line branch from Amesbury to Bulford—thus bringing railway facilities to several important military camps on Salisbury Plain. Later in the year the



ON THE QUAY AT FISHGUARD : GREAT WESTERN RAILWAY.

the North Eastern Railway, in that automatic signalling was brought into use in March on 11 miles of the main line between Alne and Thirsk. These signals are of the "Hall" electro-gas type, described in the RAILWAY MAGAZINE for December last.

The Great Eastern Railway opened a connecting line at Cromer so as to run trains through from London to Sheringham, and a new station was built at Brightlingsea.

Considerable strides were made in the development of the various "Tube" railGreat Western completed their new Cheltenham-Honeybourne line, 20 miles 62 chains long. Important widenings were carried out by the North British between College and Belgrove, and between Caldercruix and Westcraigs; and the London, Tilbury and Southend Railway pushed on the widening of the East Ham and Barking line. The most important event on the Great Northern was the commencement of the Enfield and Stevenage new line: the first portion, Enfield to Cuffley 5 miles, then being taken in hand. This length of line contains 12 bridges and two viaducts.

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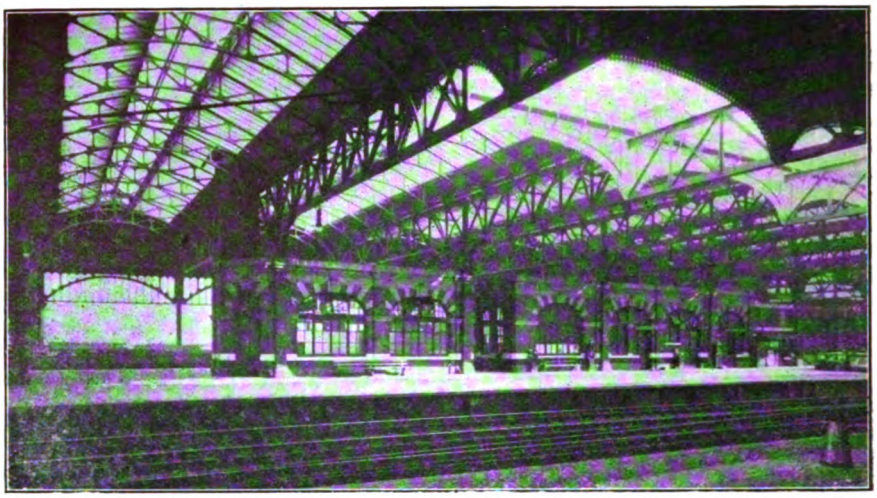

A VIEW IN THE NEW GREAT WESTERN STATION AT SNOW HILL, BIRMINGHAM.

About this time the Dearne Valley Railway, a mineral line, was also opened. It extends from Crofton on the Lancashire and Yorkshire Railway to Black Carr Junction on the Great Northern main line south of Doncaster, and has played an important part in the ever-growing development of the South Yorkshire coalfield. The Burton and Ashby Light Railway was opened in 1906. It is about 10 miles long and runs alongside the public high road for most of its length, the traffic being carried by electric trams, so that in spite of its title, it is virtually a tramway, owned by the Midland Railway Company.

On the Scottish railways, the most important event was undoubtedly the opening for traffic of the enlarged Glasgow Central station, Caledonian Railway. This work, which was carried out under the supervision of Mr. Donald Matheson, then Chief Engineer, but now General Manager, practically doubled the accommodation at the station by providing additional and longer platforms, with 13 running lines. The new portion of the station is approached by the new bridge spanning the River Clyde alongside the old one. The signalling arrangements were not completed till later, and further reference will be made thereto. The

ANOTHER VIEW AT SNOW HILL STATION, BIRMINGHAM.

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Caledonian Company also carried out improvements at Aberdeen, and opened their new docks at Grangemouth, with a total area of 116 acres. The North British Railway completed the Kincardine and Dunfermline branch, a distance of 12 miles, and also doubled the South Leith branch line; whilst the Glasgow and South Western opened, in Ayrshire, the Turnberry and Maidens Light Railway.

The *resumé* of the work done in 1906 may be concluded by stating that the Great Northern, Piccadilly and Brompton Railway was opened on December 15th. This important new "Tube," which was automatically signalled throughout on the Westinghouse electro-pneumatic system, extends Railway, and extensive new sidings on the Lancashire and Yorkshire Railway between Newton Heath and Moston. The latter company also carried out improvements at Padiham and Royton. A fine new bridge was erected by the North Staffordshire Railway over the River Dove at Norbury. It was designed by the North Staffordshire Railway Company's Engineer, Mr. Crosbie-Dawson, and consists of three bow-shaped spans, of which the centre one measures 187 ft. 6 in. long.

On the Great Central Railway, the well-known Concentration Sidings for coal traffic were completed at Wath. This was due to the foresight of Mr. (now Sir) Sam Fay, the General Manager, and the principle of

ELECTRIC TRACK LAY-OUT AT EALING COMMON: METROPOLITAN DISTRICT RAILWAY.

from Finsbury Park in the north, to King's Cross, and thence westward to Hammersmith, thus providing an important link between the northern and western suburbs.

In 1907, perhaps the most notable engineering event was the opening for traffic of the Charing Cross, Euston and Hampstead "Tube," which took place on June 22nd. This line, as most readers will be aware, runs from Charing Cross to Golder's Green, with a branch from Camden Town to Highgate. Like all the other tubes it is automatically signalled, and where signal-boxes are provided, they are power-worked on the Westinghouse system. Other works completed during this year were the Uxbridge and Denham branch by the Great Western "Hump" shunting (*i.e.*, pushing wagons up an incline and letting them run down the other side by gravity to their respective sidings) has since been adopted in several other instances.

Wath Yard was fully described and illustrated in the RAILWAY MAGAZINE several years ago, but it may be mentioned that one of the chief novelties was the use of signal-boxes with electro-pneumatic (installed by the British Pneumatic Signal Co., Ltd.) "push-button" power frames, the first of the type in this country, in connection with signals having route indicators below them.

The Great Eastern Railway opened the Beccles to Lowestoft widening, and

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re-constructed the Carlton Colville swing bridge over Lake Lothing for double-line traffic. The new bridge is electrically operated. Other undertakings in progress in 1907 were: Immingham Dock (Great Central Railway), the Hull Joint Dock (North Eastern and Hull and Barnsley Railway), and the new Enfield and Cuffley line (Great Northern Railway).

On April 1st, 1908, the widened lines of the London, Tilbury and Southend Railway were brought into use. These alterations comprised a new station with eight platforms at Barking, new bridges to replace level crossings, and additional running lines between Barking and East Ham. A new goods yard was laid down east of Barking station, and extensive sidings in the Little Ilford "Triangle" at the junction with the St. Pancras line. The widening was carried out under the supervision of Mr. J. R. Robertson, Engineer, with Mr. S. H. Ellis as Resident Engineer. It is noteworthy that among several new signal-boxes built in connection with this scheme, the East and West boxes at Barking are the largest on the London, Tilbury and Southend Railway, containing 125 and 160 levers respectively.

While speaking of signalling matters, mention must be made of the Caledonian Railway's power signal-box at Glasgow Central station, opened in May, 1908. This, containing as it does 374 levers, is one of the largest locking frames in the world. It was constructed by the McKenzie Holland & Westinghouse Power Signal Co., Ltd., on their electro-pneumatic system, and is, indeed, a wonderful example of the advantages of power signalling at a large station.

The Victoria terminus of the London, Brighton and South Coast Railway, which had for some time been in course of reconstruction, was completed in this year. The chief feature, well known to all travellers on this line, is the way in which platforms 1 to 7 inclusive can be used to hold two trains each. This is done by making the platforms very long, and by so arranging the lines that a train can reach the terminal end of a platform when a train is standing at the outer end. In connection with the alterations at Victoria, Sykes's electro-mechanical system of signalling was adopted, the signals being worked by small electrical slides and the points by ordinary large levers. Victoria South box contains 269 levers, 163 electrical and 103 mechanical, and is the largest British example of this type of locking frame. Sykes's "banner" signals are much in evidence at Victoria. Another Victoria station—at Manchester, the property of the Lancashire and Yorkshire Railway—also had important alterations completed in this year, and this Company also finished enlarging their Fish Dock at Fleetwood.

MANSION HOUSE STATION, METROPOLITAN DISTRICT RAILWAY, AS IT IS.

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CROMWELL CURVE: METROPOLITAN DISTRICT AND METROPOLITAN RAILWAYS.

The Dearne Valley Railway in South Yorkshire, of which mention has already been made, was opened for traffic, and also the South Yorkshire Joint Railway, in the same district. The latter is single throughout and extends from Potteric Carr (on the Great Northern main line south of Doncaster) to Shireoaks on the Great Central Railway. It was really built for mineral traffic, but like the Dearne Valley line, has a small passenger service also. About the middle of 1908, the Midland Company completed the electrification of their Heysham and Morecambe line, a distance equivalent to 21 miles of single track. This line was worked on the overhead wire system, with single-phase current, obtained from the generating station at Heysham.

The following year—1909—was, like 1906, signalised by the opening of a magnificent new bridge on the North Eastern Railway, this time over the River Wear. This bridge, which was opened in June, was the joint work of the railway and of the Sunderland Corporation, being situated at the latter town. It is of the girder type on masonry piers, and is "double-decked," carrying a roadway above the railway. The centre span or girder measured 330 ft., and was (and still is) the heaviest single span in the country. Like the King Edward Bridge over the Tyne, the Wear Bridge was designed by Mr. Charles Harrison, and it took 4½ years to construct. About the same time, the North Eastern Railway broke another record by opening, at York, a signal-box with the largest mechanical locking frame in the world. This box, termed "Locomotive Yard," contains no fewer than 295 levers set in one continuous row, and was built in consequence of the alterations to the South end of York passenger station, which were completed at this time.

Other events during the same year were the reconstruction of Eglinton Street station by the Caledonian, and of Moor Street, Birmingham, by the Great Western, the latter work being completed by July 1st. On the North British, the important widening between Portobello East and Piershill was practically finished, including several new bridges and signal-boxes. In December, 1909, the London, Brighton and South Coast completed and opened the electrified South London line between Victoria and London Bridge. The distance is nearly 9 miles and there are nine intermediate stations. The system is single-phase alternating high-tension, with overhead wires and conductors, and the line as altered has proved a great success, competing successfully with the tramways which had previously carried most of the traffic.

The great feature of the next year, 1910, was the completion of the Great Western's new route to the north-west, *viâ* Ashendon

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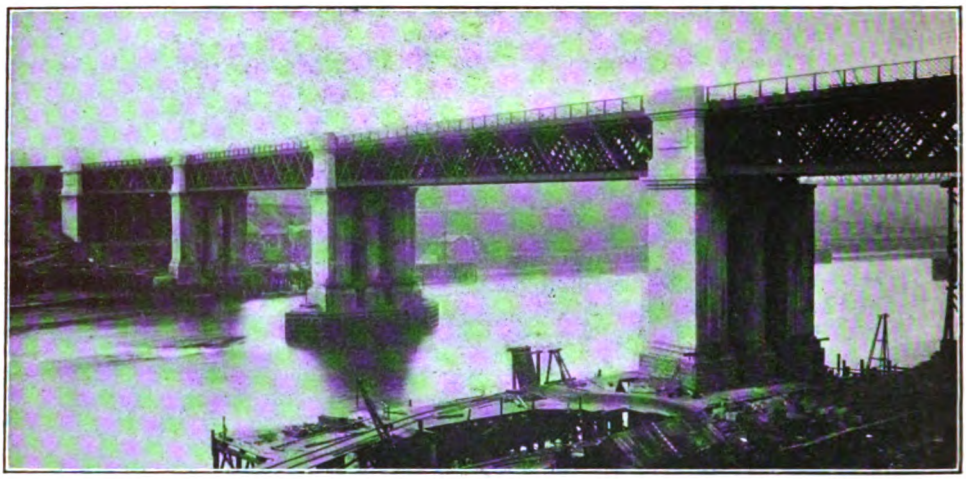
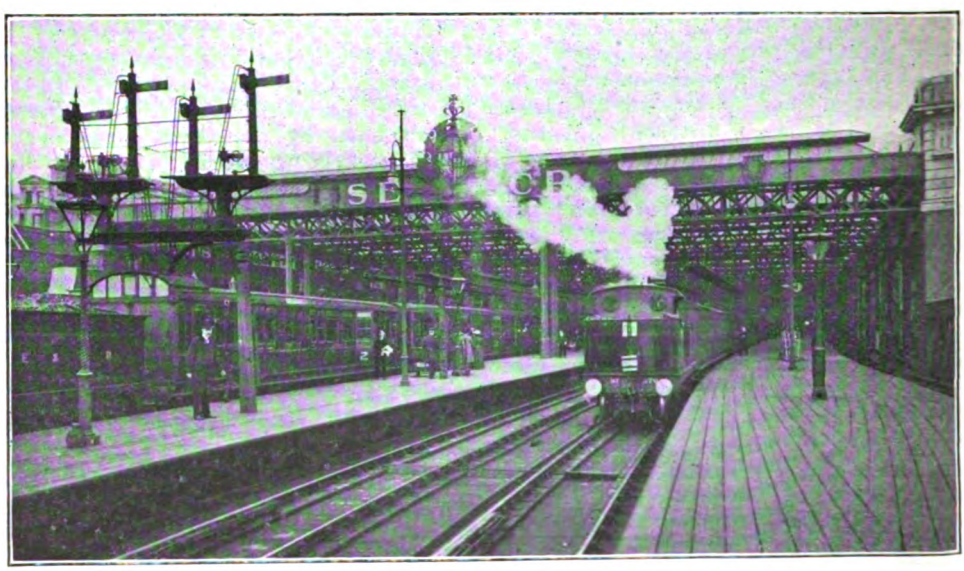


KING EDWARD VII. BRIDGE AT NEWCASTLE: NORTH EASTERN RAILWAY.

and Aynho Junction. This line had been under construction for some time, and was opened on April 4th for goods traffic, and later for passenger traffic. The work includes a long viaduct of 24 arches at Souldern, and five intermediate stations; three of these—Bicester, Brill, and Ardley—have four lines through them, the remainder of the line being double. By the opening of the new line, the distance between Paddington and Birmingham was shortened by 19 miles. The Great Western Railway also opened in this year a new branch between Avonmouth and Filton, connecting Avonmouth Docks with the main line between South Wales and London. Another Great Western venture was the Camerton and Limpley Stoke line, opened in the spring; this line, which was constructed by Pauling & Co., the Westminster contractors, was 8 miles long, and connected Camerton with the Bath and Salisbury line. The work included two stations and three "halts."

The London and South Western Railway pushed on with their scheme for the enlargement of the Waterloo terminus, and on



CHARING CROSS STATION: SOUTH EASTERN AND CHATHAM RAILWAY.
Showing new roofing installed in place of the old arched roof.

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July 25th five new platforms were brought into use; whilst the Great Eastern Company finished important improvements at Parkeston Quay, Harwich, and opened a new station at Gidea Park. The North Eastern Railway opened a large "power" signal-box at Newcastle Central station, replacing four manually-worked ones. It contains 266 electro-pneumatic levers (Westinghouse system), and several illuminated diagrams. It controls the north end of the Central station.

In 1911, a noteworthy engineering event was witnessed in South Wales in the opening of the Cardiff Railway on February 27th. This line extends from Heath Junction, two. Two "derelict" railways were revived in 1911, namely the Mawddwy Railway in North Wales (worked by the Cambrian Railways), and the Shropshire and Montgomeryshire Railway. The latter was formerly known as the Potteries, Shrewsbury and North Wales Railway, and owing to financial troubles was closed in 1880. However, with the increased demand for greater railway facilities in the district, the railway has been re-opened, with Mr. H. F. Stephens as Managing Director. The line extends from Shrewsbury (where it has its own station) to Llanymynech, about 18 miles, with ten intermediate stations. A six-span bridge carries it over the River

VICTORIA STATION AS REBUILT: SOUTH EASTERN AND CHATHAM RAILWAY.

2¼ miles from Cardiff Docks, to Treforest on the Taff Vale Railway, a distance of about 12 miles. For such a short line, a considerable number of important engineering works are involved, including nine bridges and various cuttings and embankments. The Great Central opened their "Doncaster Avoiding line," as it is called, in July, 1911. As its name implies, this line enables Great Central trains to avoid passing through Doncaster station, and thus relieves the enormous congestion of traffic which used to take place.

The South Eastern and Chatham Railway completed improvements at Rochester, the lines being widened so as to give four tracks through the station instead of Severn. Another new line, opened in 1911, was the North British Railway Company's branch between Grangemouth and Camelon, but this was purely a goods and mineral line.

In Ireland, the Belfast and County Down Railway re-signalled Belfast terminus, Messrs. Tyer carrying out the work; and one of the new signal-boxes, with 122 levers, is the largest yet built in Ireland. The Highland Railway completed a number of minor improvements in the way of widenings, crossing loops, etc., and they also renewed the bridge over the River Spey at Orton.

The following year, 1912, will always be memorable on account of the opening of the

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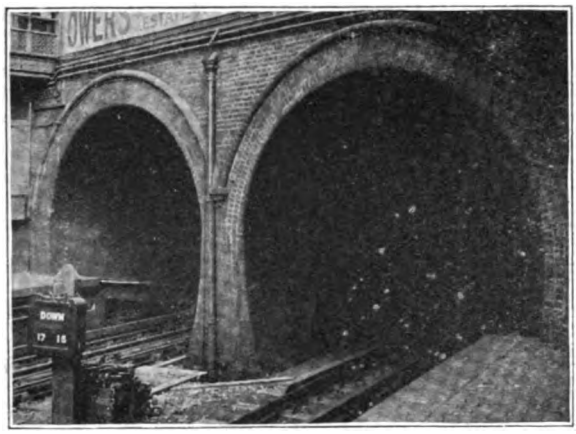


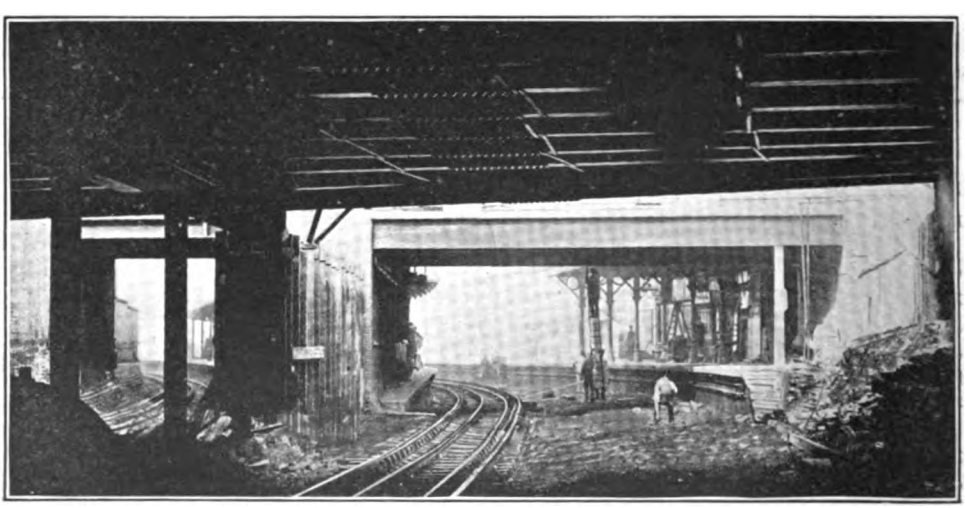
FINCHLEY ROAD OLD TUNNEL: METROPOLITAN RAILWAY.

Immingham Dock (Great Central Railway) by the King, on July 22nd, Mr. Sam Fay, the General Manager, being knighted on this occasion. Full accounts of the Immingham Docks have already appeared in the RAILWAY MAGAZINE, as well as many other periodicals, so there is no need to recapitulate them here. On May 1st, the Selby and Goole branch of the North Eastern Railway was opened for passenger traffic.

An important work, which was practically completed in the summer of 1912, was the new Snow Hill station of the Great Western Railway at Birmingham. It has 12 platforms, and all the station buildings, etc., are of the most up-to-date description. Snow Hill is interesting as being the first large Great Western station to be equipped with power signalling.

The London, Brighton and South Coast Railway completed further electrification works during 1912. On the London and North Western Railway several widening schemes were pushed on, and among those completed were the widening of the Rickmansworth branch at Watford, and the new line to Croxley Green. Doubling operations on the Metropolitan Railway, between Wembley Park and Finchley, made considerable strides during this year.

During the past year, 1913, no very important new works have been opened, though several are rapidly approaching completion. Among these may be mentioned improvements at Charing Cross on the London Electric "Tube"; the electrification on the London and North Western suburban lines and similarly on the London and South Western Railway, and the enlargements at Waterloo on the latter railway. Of work actually completed in the year just past, there are the Derwent Valley Light Railway and the Elsenham and Thaxted Light Railway. The Great Western Railway opened an important goods and mineral line in South Wales, namely the Swansea District Lines, as they are called, near Llanelly.



OPENING OUT FINCHLEY ROAD TUNNEL TO TAKE FOUR ROADS: METROPOLITAN RAILWAY.

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Photo] [*F. E. Mackay.*

CALEDONIAN RAILWAY:
Glasgow-Euston Restaurant Car Express.
4–6–0 locomotive (Schmidt superheater) No. 906.

Passenger Train Service Developments.

By G. W. J. POTTER.

IN the eight years which have elapsed between the publication of the centenary and bi-centenary numbers of the RAILWAY MAGAZINE, it is inevitable that many changes should have occurred in the passenger train services. Possibly it may be thought that there is little worth chronicling, as every spring and summer witnesses the coming of the trains destined to convey holiday-makers to sea, country, and the mountains; likewise the autumn marks the cancellation of the summer and the resumption of the winter services. Those persons who usually go to one particular place know that their train as a rule re-appears at about the same time as in previous years, with perhaps an occasional alteration of a few minutes, and hence there is a temptation at first thought to conclude that there has been little variation between the services of 1905 and 1913.

This supposition is to some extent correct, but closer examination reveals the fact that in addition to a few new schedules involving high average speeds and notable locomotive work, there have been a large number of adjustments, accelerations, amplified connections, and improvements in train services generally. Several new through routes have been opened, and cross-country services developed; while in a number of instances special rolling stock has been introduced for particular trains.

The partial withdrawal of competition between various companies and the establishment of agreements and combinations has enabled traffic officers to develop train services on a more scientific basis than formerly, thus giving passengers improved, or at any rate equal, privileges and facilities in travelling, and at the same time adjusting services so that charges per train mile run are not so high as they otherwise might have been. Competition still remains to some extent; and working agreements and arrangements between pairs or groups of companies do not eliminate this healthy factor, though they may modify the form which it takes. It is not only the companies which benefit; the travelling public also gain largely.

To set forth all the alterations and developments which have taken place in the period selected for review would require several extra issues of the RAILWAY MAGAZINE, so a brief review of some of the more noteworthy changes only will be attempted, commencing with the 1905 arrangements.

CALEDONIAN RAILWAY.

On this line the principal changes relate to the long distance residential services which have been strikingly developed during recent years in carrying out the policy adopted by the Company. Among the new and improved trains may be mentioned

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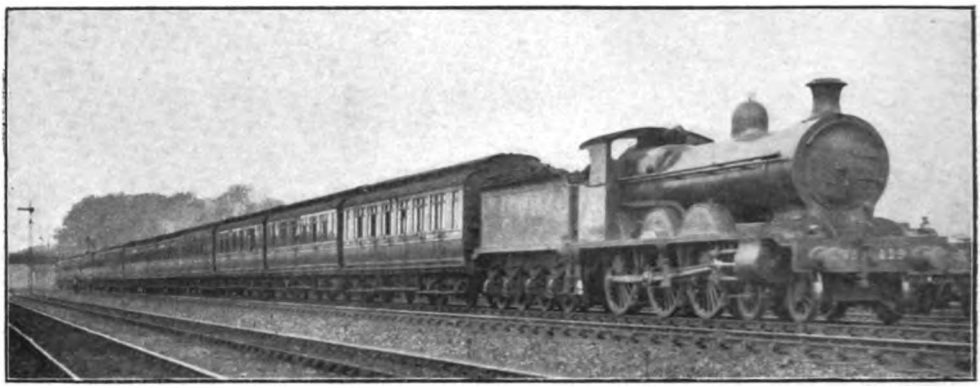

Photo] [*F. E. Mackay.*

GLASGOW AND SOUTH WESTERN RAILWAY:
St. Pancras Restaurant Car Express passing Kingmoor.
4–6–0 locomotive No. 119.

"The Strathearn and Ben Ledi Districts Express," between Glasgow and Callander, Crieff and St. Fillans; the "Tinto" express serving places of like interest south of Carstairs; and several others of a more or less similar character. Some of them have Edinburgh portions or connections, and in the aggregate have done much to create a considerable long distance residential traffic, either during the summer months or all the year round. In a few cases trains on the northern main line have been diverted to run to and from the Central station in Glasgow instead of Buchanan St., thus facilitating connections with trains using the principal terminus. The introduction of Sunday trains on the Gourock route, in connection with steamers, and on certain local lines in Glasgow, has caused considerable discussion, and produced petitions against their retention; but the fact that such trains have often had to be duplicated is evidence that they have justified their running.

Certain of the West Coast trains between Carlisle and Aberdeen in the summer of 1908 were hauled by one locomotive for the complete journey of 240 miles.

The now celebrated motor-propelled service across the Connel Ferry Viaduct from Connel Ferry to Benderloch, conveying passengers, also motor-cars, was instituted in July, 1909.

Glasgow and South Western Railway.

There have been few alterations of importance on this line, but many detail improvements. In 1908, in conjunction with a new Midland service, a non-stop express was run between Carlisle and Glasgow, but this did not reappear the following year.

Great Central Railway.

The Great Central's Sheffield Special was in 1906 booked to run from Marylebone to Sheffield (164¾ miles) in 2 hrs. 50 min., to which the Great Northern replied by a dining-car express in the same time (162 miles).

Many of the express trains were run over the new route *viâ* High Wycombe, thus involving a higher speed, as the new line is longer than the old. The Grimsby services were accelerated. Cross-country services—the great feature of the Great Central programme—were also much in evidence: such as the London-Scarborough, Sheffield-Scarborough, Sheffield-Llandudno, Leicester-Blackpool, and Leicester-Aberystwyth.

In 1907 the through service from Newcastle and York to Oxford, Southampton and Bournemouth was revived and accelerated. The Manchester and London trains were also quickened. The Lancashire, Derbyshire and East Coast Railway having been absorbed by the Great Central, new junctions were constructed, and an improved service of trains was instituted. Towards the end of the year the Stratford-on-Avon trains were quickened and new facilities provided.

Each succeeding year has witnessed variations and improvements in the ordinary, and cross-country, and through carriage, services; not always accelerations in the matter of speed, but involving the multiplication of facilities for through travel with a minimum of change. Indeed, the Great

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Central is now concerned in a remarkable series of cross-country arrangements, working over the Great Western, North Eastern, Lancashire and Yorkshire, Great Eastern, Great Northern and London and South Western Railways, as well as certain other lines to a limited extent.

Great Eastern Railway.

In July, 1906, the service over the new line from the Cromer branch to West Runton and Sheringham was put into force, the fastest trains being the 1.30 p.m. from Liverpool Street, due Sheringham 4.43, and the 12.36 p.m. thence, due in London at 3.55 p.m. In each case a non-stop run was made between Liverpool Street and North Walsham. The Cambridge, Lynn, and Hunstanton services were improved and restaurant cars provided on certain trains.

Next year a new express left Liverpool Street at 9.50 a.m., reaching Cromer in 3 hrs., Sheringham in 3 hrs. 20 min., and Mundesley in 3 hrs. 37 min., the return train leaving Sheringham at 2.58 p.m., connecting with the 3.55 *ex* Cromer, and showing a gain of 36 min. on the 1906 booking. Felixstowe passengers were conveyed by a new train at 4.10 p.m., the acceleration being 15 min.

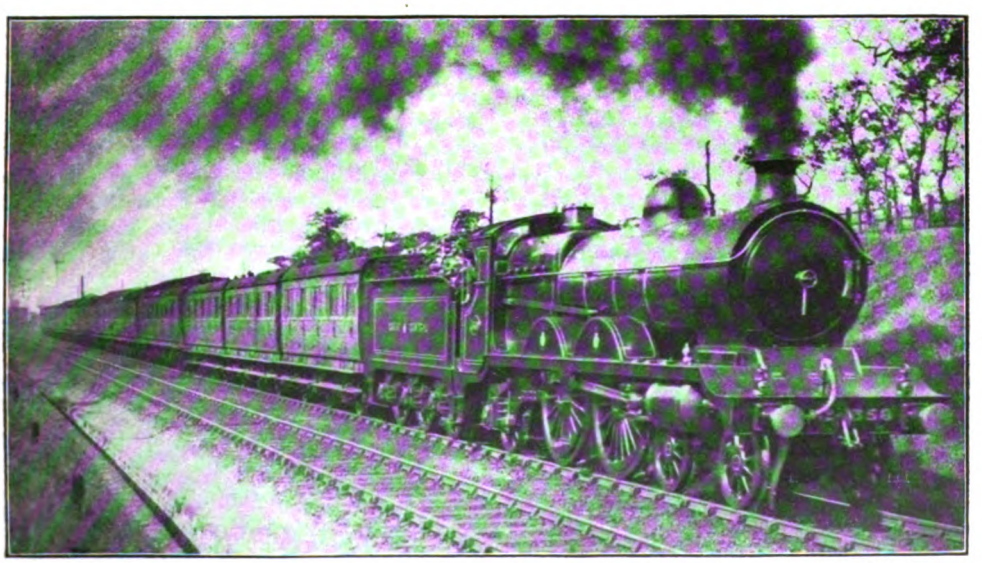
The Norfolk Coast Express, taking old schedules, but with new and special rolling stock, made its entry with the bookings of Liverpool Street 1.30 p.m., Cromer 4.25, Sheringham 4.43, and Mundesley 4.34. On the up journey the times were; Cromer 1 p.m., Sheringham 12.36, Mundesley 12.47, Liverpool Street 3.55. A new restaurant corridor train was built for the service, consisting of 12 carriages, and weighing about 320 tons.

1910 witnessed the addition of restaurant cars to more of the seaside expresses, and the introduction of special trains catering for the Clacton-on-Sea and Walton-on-the-Naze traffic. In connection with an amplified restaurant car policy, several secondary trains of an unusual character have been so provided, and a considerable catering business on point to point journeys thus created.

In May, 1911, the Southend services were seriously taken in hand, with the result that a number of expresses were put on at convenient times for business men, and restaurant services were provided on several trains. Additional trains were placed on the seaside services, and in many cases it was found possible to cut down the running time by a few minutes. In 1913 several changes were made in the express bookings, but while some of them involved additional trains they did not include novel schedules.

Great Northern Railway.

In 1906 the 10 a.m. Scotch express ceased to call at Grantham and York, and ran from



Photo] [*F. E. Mackay.*

GREAT CENTRAL RAILWAY:
Manchester-London Express passing Godley Junction.
4–4–2 locomotive No. 358.

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Photo] [*F. E. Mackay.*

GREAT EASTERN RAILWAY:
Yarmouth Express passing Chadwell Heath.
4–6–0 locomotive No. 1503 and 4–4–0 locomotive No. 1884.

London to Doncaster non-stop. This booking was afterwards given to the 9.50 a.m. relief train, and later the York stop was reinserted. The Sheringham and Cromer services were improved, owing to the Great Eastern having now obtained entrance to the former place. In 1907 the Yorkshire services were revised, and the King's Cross-Sheffield non-stop run disappeared. In the up direction a new train left Halifax at 1.15 p.m. and Huddersfield at 1.25 p.m., connecting at Wakefield with the 2 p.m. thence to King's Cross, this section being covered without a stop. Through services from Lancashire and Yorkshire to the Norfolk coast *viâ* Essendine, Bourne, and Spalding were introduced in 1908 in place of the Peterborough route.

A mid-day Sunday service by the East Coast route from Edinburgh to London was made possible in 1909 by a train leaving Waverley at 12.10 p.m. and connecting at York with the 5.15 p.m. express thence to King's Cross. From July 1, 1910, the 3.15 a.m. from King's Cross left at 3 a.m., and by additional stops and rearrangements made an excellent early morning train to the West Riding towns. Additional facilities between Leeds and Doncaster in connection with the Great Eastern Continental express thence were introduced.

In July, 1910, in consequence of certain Midland improvements a new express was hurriedly introduced leaving King's Cross at 2.15 p.m. for Leeds and Bradford, with a corresponding return train. These provided the fastest schedules between London and Doncaster, but were always light, though they were retained until the coal strike of 1912, after which they were not reinstated.

July, 1911, witnessed the running of through vehicles, in connection with Great Northern trains, from King's Cross to the South Eastern and Chatham system; and in the reverse direction carriages from Deal, Dover, and Folkestone arrived in time to connect with the 1.40, 2, 2.15, and 2.20 expresses from King's Cross. The through Bournemouth services did not reappear this year.

In conjunction with the North Eastern Railway, improvements were made from time to time in the services to and from Scarborough and Whitby, and in 1912 through coaches for Stockton and West Hartlepool were run by certain principal trains, accelerating the journeys involved to a notable degree.

In 1913 altered arrangements were made in conjunction with the South Eastern and Chatham Railway, amounting virtually to running portions of the "Granville" expresses to and from King's Cross.

Great Northern (Ireland) Railway.

A new route was opened from Belfast to Newcastle (co. Down). The mail services between Dublin and Londonderry were improved to the extent of 15 min. in each

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direction by means of the introduction of the staff-changing apparatus in place of hand changing.

Improvements in the express service between Dublin, Belfast, and Bundoran came into force on June 8, 1907. In subsequent years various detail improvements have been made, and in 1913 several express trains between Dublin and Belfast were accelerated.

GREAT NORTH OF SCOTLAND RAILWAY.

Engines of the Great North of Scotland commenced in 1908, to run through from Keith and Elgin to Inverness, and the Highland Company's locomotives travelled from Elgin to Aberdeen.

GREAT WESTERN RAILWAY.

The opening of the direct main line to the West, in 1906, altered many of the principal trains. The Riviera express—from July 21—left Paddington at 10.30 and reached Penzance at 5.10 p.m. (an acceleration of 20 min.). Exeter was served by a "slip" in 3 hrs. 3 min. The Cornishman started at 11.10, and running *viâ* Castle Cary, was due at Penzance at 7 p.m. (15 min. gain). Other Cornish trains were the 1 p.m., reaching Bristol in 2 hours, and Penzance at 9.40, and the 3 p.m. *viâ* the new line, due Penzance at 11.26 p.m. Many other towns had their train services materially improved both up and down.

The 8.30 a.m. from Plymouth by the new route was booked to arrive at 1.35 p.m. (25 min. gain). The 7 a.m. from Penzance ran *viâ* Castle Cary, saving 22 min., and was due at Paddington at 3.15. Commencing on July 23, the up "Riviera Limited" left Penzance at 10 a.m., the old time, made a non-stop run from Plymouth to Paddington *viâ* the new line, and was due at 4.45 p.m., a gain of 15 min.

On August 30, 1906, the Fishguard-Rosslare route to Ireland was inaugurated, involving new trains, and in due course causing many associated developments, particularly since Fishguard has also become a port of call for trans-Atlantic and other liners.

Another train to Birmingham in 2 hrs. 20 min. was added in 1907, and the Shrewsbury and Chester services were accelerated, the 10 a.m. from Shrewsbury to Paddington being booked to arrive at 1.45 instead of 2.15 p.m. The new loop at Honeybourne was utilised for the improvement of the Cheltenham services. Aberystwyth received additional facilities.

Excursions from Paddington to Killarney were run, and the railway journey to and from Fishguard (261½ miles) was frequently made without a stop. Circular day trips, enabling the holder to visit Worcester, Hereford, Great Malvern, and Gloucester, staying a short period at each, were a novelty introduced by this company. Another, in the Wye Valley district, allowed the excursionist to break his journey at Chepstow, Tintern, Symond's Yat, Ross, or Monmouth. The condition was that he could break his journey at any of the above named places, resuming it by any train, provided that he caught the specified train for his return to London. A non-stop day excursion to

Photo] [*F. E. Mackay.*

GREAT NORTHERN RAILWAY:

Scarborough and Whitby Restaurant Car Express (North Eastern train) passing Potters Bar.
4–4–2 locomotive No. 1447.

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Photo] [*E. A. Gurney-Smith.*

GREAT WESTERN RAILWAY:
Up train leaving Teignmouth.

Cornwall, with a trip on the river Tamar, was another new attraction. The services over the new Birmingham-Cheltenham route were amplified in July, 1909, and the Irish services were quickened. In the autumn the Cunard steamers commenced to call at Fishguard, and some very fine running of the trains in connection therewith took place.

July, 1910, saw the opening of the new route to Birmingham for express passenger trains, many of them being timed to accomplish the journey in two hours. The intermediate stations on the route, such as Leamington, Banbury, High Wycombe, etc., naturally obtained excellent facilities in the way of quick trains either to the North or to London. Shrewsbury and Chester services were quickened. In the autumn additional Sunday expresses were placed on the Birmingham route. A new service was inaugurated between Wolverhampton and Victoria (South Eastern and Chatham) *viâ* Bicester.

The summer of 1911 was chosen for the very thorough overhaul of the Penzance, Plymouth, and Bristol services, and many notable improvements were introduced. A new train left Penzance at 1.15 p.m., and was due at Paddington at 8.40 p.m. By means of carefully considered connections, it gave an excellent service from the West to all parts of the system. The 1 p.m. down express ceased to run through to Devon and Cornwall, though its schedule to Bristol and other places was retained by the 1.5 p.m. train; and the long distance traffic was given to the new 1.30 p.m. express *viâ* Westbury, due at Penzance 9.25 p.m. Many of the new connections given benefited the traveller by from 30 to 55 minutes as compared with the old timings. Additions were made to the two-hour Birmingham trains, also to other associated services. The Fishguard, Aberystwyth, Chester, and Birkenhead through trains were improved in working.

During last summer a third class only express for tourist and ordinary passengers was added by the Great Western Railway, known as the "Devon and Cornwall Special," and booked non-stop between Paddington and Newton Abbot. Further changes in the Birmingham service could also be referred to, as also general improvements; but it is unnecessary to deal therewith in detail.

Highland Railway.

In 1907 a new express left Aviemore at 8 a.m., after the arrival of the sleeping-car trains from London, and ran to Elgin. Year by year various improvements were made in the company's services, hardly important enough to chronicle, but often making all the difference in the comfort of the traveller. In 1910 special excursion facilities were introduced, these in some cases involving the running of new trains, and passengers were thus tempted to explore the beauties of the scenery through which the Highland runs.

Every Tuesday during the summer of 1911

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a through service to Strathpeffer was provided off the 11.50 a.m. from Perth, running *viâ* Carr Bridge and avoiding Inverness. This is still retained and now ranks as a very important facility.

LANCASHIRE AND YORKSHIRE RAILWAY.

The principal novelties of 1906 were the Continental boat services to and from Hull and the trains running in connection. Southport and Fleetwood services to Manchester received attention in the 1907 summer, and other holiday district trains were improved. In 1908 dining cars were placed on the through trains between Liverpool and Newcastle-on-Tyne, special rolling stock, provided respectively by the two companies concerned, being introduced.

The summer of 1909 witnessed several new express services between Lancashire and Yorkshire centres and towns on the Midland and London and North Western systems, this being the result of the triple agreement between the three companies. In the following year through services were run on Mondays and Saturdays between Colne, Burnley, Accrington, etc., and the Peak District, and new trains and connections *viâ* Thornhill to St. Pancras were introduced.

One does not often chronicle the arriving of a slip carriage at its destination before that of its parent, if the original train may so be styled. However, in July, 1911, a slip was booked to be detached from the 5.10 p.m. club train from Manchester at Kirkham, whence it was taken over the new direct line to Blackpool, arriving 14 min. before the main portion, which had gone *viâ* the old route. The through services to the South Coast were further extended and improved.

LONDON AND NORTH WESTERN RAILWAY.

In view of the approaching Great Western competition, expresses between Euston and Birmingham in two hours had been inaugurated in March, 1905, by the London and North Western Railway, and a new non-stop service from Euston (5.55 p.m.) to Liverpool, Edge Hill (9.23 p.m.) was put on in July. A considerable number of important improvements between the principal Lancashire and Yorkshire towns, on one hand, and South Wales and the West of England, on the other, were introduced about this period. A new afternoon service to Bristol, Exeter, Torquay, and Plymouth was put on, leaving Lime Street at 12 and London Road, Manchester, at 12.15.

In 1907 the up morning Manchester services were revised, so that the service was 9.45 and 10.10 from London Road, due Euston at 1.15 and 2.10 p.m. A new connection was given to Southport so that it could be reached at 10.14 p.m. by the 5.55 *ex* Euston. Returning from Southport at 10.10 a.m., the train was due at Euston at

Photo] [*F. E. Mackay.*

LANCASHIRE AND YORKSHIRE RAILWAY:
Leeds and Bradford Luncheon Car Express passing Mytholmroyd.
4–4–2 locomotive No. 1424.

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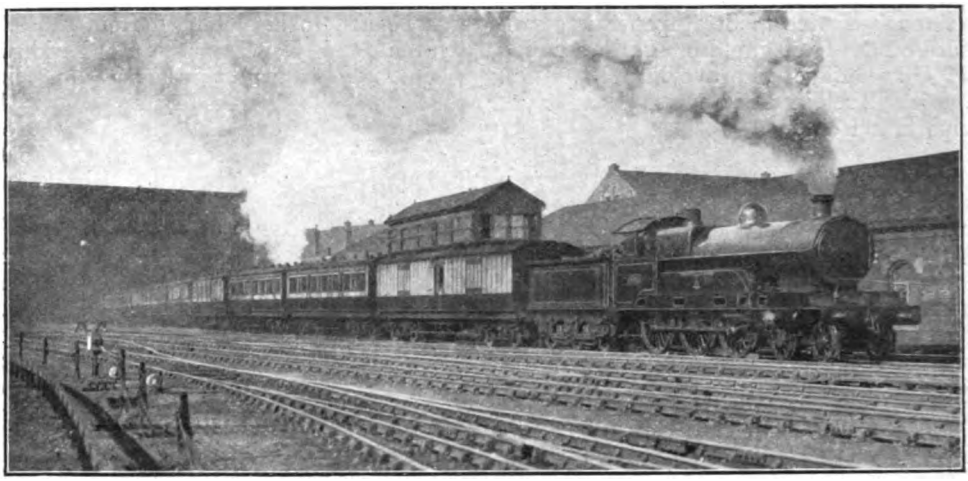

Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY:
Oban-Euston Restaurant Car Express leaving Carlisle.
4–6–0 four-cylinder (Schmidt superheater) locomotive No. 650 *Lord Rathmore.*

3.10 p.m. On July 13 the now familiar American Boat Special was run from Euston for the first time.

In connection with the Great Western and Great Eastern Companies a through West and East service came into operation in July, 1908. Cardiff was left at 10.20 a.m., and running *viâ* Newport, Cheltenham, and Leamington, its course over the London and North Western was by Rugby and Market Harborough to Peterborough (3.10 p.m.), thence by Great Eastern *viâ* March and Norwich to Lowestoft (6.55) and Yarmouth (7.18 p.m.). In the opposite direction, Yarmouth was left at 10.5 a.m. and Lowestoft at 10.1, Peterborough 1.35, reaching Leamington 3.5 and Cardiff 6.15 p.m. By a rearrangement of trains, the service time was next year reduced by 73 min. between Cardiff and Yarmouth and 50 min. as between Cardiff and Lowestoft.

The so-called Rhyl non-stop, which had previously called at Crewe for locomotive purposes, was in 1909 accelerated by 8 min., and ran right through to Rhyl without calling anywhere. A restaurant service between Liverpool and Newcastle-on-Tyne was introduced, probably to balance the Lancashire and Yorkshire service between the same places.

In February, 1910, a restaurant service was instituted between Birmingham and Broad Street (North London Railway), leaving New Street at 8.20 a.m. and arriving in London at 10.35. On its return journey the "City to City Express" left Broad Street at 5.25 p.m., called at Willesden Junction 5.44 p.m., and was due at Birmingham at 8.5 p.m. A decided novelty was the provision of a lady shorthand-typist, who would carry out any work required by business men while on the journey.

Working agreements between the Midland and Lancashire and Yorkshire Companies enabled the officials to improve the connections and cross-country services of the partners. Alterations in 1911 related largely to seaside travel from the less important stations, and thus to a large extent provided through trains or lessened the number of changes which were formerly necessary. In July, 1912, new lines between Willesden and Harrow were brought into use, and in February, 1913, they were completed through to Watford Junction, *viâ* Watford, High Street.

LONDON AND SOUTH WESTERN RAILWAY.

In 1906 the luncheon car train left Exeter at 10.17 and called at Sidmouth Junction to take up passengers who had come from Sidmouth by a new train leaving there at 10 a.m. The 10.40 a.m. down West of England express was booked to call at Queen Street, Exeter, at 2.3 p.m.

A large number of improvements characterised the 1907 summer programme. A new luncheon corridor express left Waterloo at 12 noon for the Devonshire resorts, due at Exeter 3.36, Torrington 5.9, and Ilfracombe 5.28. The return times were Torrington 11.28, Ilfracombe 11.15, Exeter 1.5, Waterloo 4.29. North Cornwall passengers

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were taken by a train at 11 a.m. from Waterloo, due Exeter 2.17, Bude 4.8, Bodmin 5.13, and Padstow 5.2. Padstow was left at 10.55 a.m., Bude 11.57, Launceston 12.13, Exeter 1.55, and Waterloo was reached 5.12. Other West of England expresses were accelerated by 15 or 20 min.

Introduced in 1907, the through express service between Brighton, Salisbury, and Plymouth was re-instated and considerably improved in 1908. Luncheon and dining cars were added to several of the chief services to and from Waterloo.

Easter, 1909, witnessed the introduction by Mr. H. Holmes of a half-hourly service from Waterloo to Bournemouth between the hours of 1.20 and 8.20 p.m. to meet the demands of the holiday traffic, and this policy has since been adopted more or less systematically at holiday periods. In July the Portsmouth services were revised, and it became possible to reach Fratton in 1 hr. 41 min. from Waterloo.

A working agreement with the Great Western was arranged in May, 1910, this leading to many betterments of the train services and through connections. The summer witnessed the introduction of new trains between Manchester and Birkenhead *viâ* Basingstoke to Bournemouth and Southampton. A new express to Southampton in connection with a boat to Havre commenced running three times weekly.

Two hours as the booked time for trains between Waterloo and Bournemouth came into operation in July, 1910, the 4.10 p.m. and 9.8 a.m. being the two concerned, and later the 2 p.m. up train was given the same schedule, and the 2 p.m. down express the equivalent with the Christchurch stop. Additional trains to and from Southampton to suit the Havre and other services have characterised recent years, and the Continental trains were, last summer, provided with restaurant cars. Similar cars have also been placed on certain Portsmouth trains.

London, Brighton and South Coast Railway.

In 1906 a through train was run between Brighton and Paddington, leaving at 11.30 a.m., returning at 3.40 p.m. from the Great Western terminus. This service did not appear in the following season (1907), but further facilities were introduced in the coast service from Brighton to the London and South Western system *viâ* Cosham and thence to Salisbury, Exeter, and Plymouth.

In December, 1909, the electrified service of trains over the South London line came into use, and from the first they were highly successful. These services have since been extended and amplified.

The " Southern Belle " having proved so popular, commenced in June, 1910, to make four trips daily between Victoria and

Photo] [*F. E. Mackay.*

LONDON AND SOUTH WESTERN RAILWAY:
Up Ilfracombe Express passing Earlsfield.
4-4-0 locomotive No. 472.

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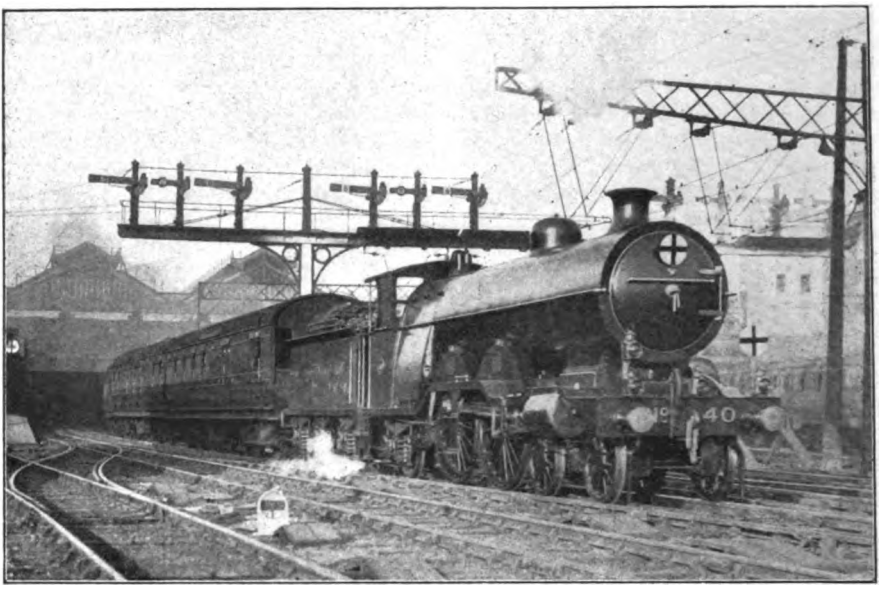

Photo] [*F. E. Mackay.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY:
Portsmouth Express leaving Victoria.
4–4–2 locomotive No. 40.

Brighton instead of two as previously; the times were: Victoria 11 a.m., returning from Brighton 12.20 p.m.; Victoria 3.10 p.m. and Brighton 5.45 p.m.

In 1913 third class carriages were attached to the 12.20 p.m. up and 3.10 p.m. down journeys, creating the curious situation of a train conveying only Pullman and third class passengers.

During the last few years there have been numerous improvements and accelerations in the Brighton, Worthing, Eastbourne (85 minutes was adopted for up trains in 1913), Hastings and other services; but these are too numerous to chronicle in detail.

Midland Railway.

In 1907 the Birmingham-Bristol service was increased by a non-stop express at 9.8 a.m. from the former town, due Bristol at 10.58, and a 4.20 p.m. from Bristol, non-stop to Birmingham. The Scotch services from Bristol were improved and extended, likewise those running to and from London.

On April 1, 1908, a new through restaurant service was introduced between Newcastle and Bristol. The so-called non-stop run from St. Pancras to Carlisle appeared in July, but a stop was always made at Shipley (206 miles) to change engines. Several of the Scotch services were slightly accelerated. The services between Liverpool, Manchester, and London were revised and, on the whole, accelerated.

In 1908 a Saturdays only Scotch express with third-class luncheon car was introduced, and passengers holding cheap or excursion tickets were conveyed by it to Carlisle, Edinburgh, Glasgow, etc. A new express left St. Pancras at 6 p.m. for Sheffield (first stop), Leeds, Bradford, Heysham, etc. The old 5 p.m. now terminated at Bradford. The Manchester services were quickened, and the up 10.30 a.m. from Waverley was booked to arrive in London at 7.15 instead of 8.5 p.m.

The 1 p.m. Leeds to St. Pancras was in July, 1910, accelerated, and it also had a long non-stop run of 163¾ miles (Rotherham-St. Pancras) allotted to it. Two of the Scotch expresses ran *viâ* Ingleton and Penrith instead of *viâ* Appleby. The opening of new lines on the Western route led to considerable improvements in the services from Bristol and Birmingham to Derby and other parts of the Midland system.

In August, 1912, the London, Tilbury and Southend Railway was taken over by the Midland Company. During the summer of 1913 through trains were run from Leeds to Keswick *viâ* Ingleton and Penrith, in place of the Scotch trains previously running over that route. The Midland has been concerned in several developments in cross-country

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train services, notably in the transfer from and to the London and North Western at New Street, Birmingham, in conjunction with through arrangements between Manchester, and Southampton and Bournemouth.

NORTH BRITISH RAILWAY.

In May, 1907, the working of the Invergarry and Fort Augustus Railway was taken over from the Highland, and the service by the North British Railway to and from Spean Bridge was slightly rearranged and amplified. This was discontinued in October, 1911, when the line was closed until August,1913.

Restaurant cars were placed in the 1909 summer on the 7.30 a.m. Edinburgh to Perth, and on the 12.30 p.m. from Perth in the opposite direction. A through carriage to St. Pancras was attached to the 5.5 p.m. from Fort William. In 1910 connections with the Great North of Scotland were improved, and the through carriage working between various points was adjusted so as to permit of less delay in working.

During recent years great strides have been made, important trains being provided with special rolling stock, connections improved, and journeys accelerated. In 1912 the "Lothian Coast Expresses" were introduced, scheduled between Edinburgh and Glasgow in 60 minutes. The West Highland traffic has also received special attention.

NORTH EASTERN RAILWAY.

The new King Edward bridge at Newcastle-on-Tyne was officially opened by King Edward VII. on July 1, 1906, but it was not until the autumn that trains in general were booked to run over it. The Scotch services were thus enabled to enter the Central station from the western end instead of the east as formerly, obviating the reversal of direction to which they all had formerly to submit.

Seaside services between Scarborough, Bridlington, and Whitby and the inland towns were improved, but there was nothing special to quote this year. In 1907 a large number of small alterations were made, calculated to greatly improve the various connections at the numerous junctions on this line. An additional non-stop express was put on between York (9.43 a.m.) and Bridlington (10.45 a.m.). Returning, Bridlington was left at 6.45 p.m., York being reached at 7.45 p.m., here connecting with the important North trains. Residential seaside express services between Leeds, York, and Scarborough, also between Hull, Filey, and Scarborough, were introduced in 1908 as early as April and May, and usually with improvements on previous schedules.

The 1.40 p.m. King's Cross to Harrogate was booked in the 1908 summer to run on to Northallerton, Stockton, West Hartlepool, and Sunderland, greatly improving connections and the time occupied. The return journey was similarly arranged. A new through luncheon car express between Whitby, Scarborough, and King's Cross made its appearance in July, 1909. King's Cross was left at 1.5 p.m., and with stops at Peterborough and Doncaster, Scarborough was reached at 5.50 and Whitby at 6.40, the dividing place of the sections being Rillington Junction. The return was fixed at 9.55 a.m,

Photo] [*F. E. Mackay.*

MIDLAND RAILWAY:

Edinburgh-St. Pancras Restaurant Car Express leaving Carlisle.

4–4–0 locomotive No. 992.

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Photo] [*J. B. Sherlock.*

NORTH BRITISH RAILWAY:
West Highland train at Glenfinnan.
Locomotives Nos. 865 and 679.

from Whitby and 10.55 a.m. from Scarborough, joining at Malton, and with stops at York, Doncaster and Peterborough, being due at King's Cross at 3.58 p.m. The seaside expresses between Bridlington, Filey, and Scarborough and York, Leeds, and incidentally other towns, received additions and quickenings, making the service between these points a fine one.

Additional Scottish Sunday trains were provided, the times being: York dep. 2.15 p.m., Berwick 5.11–5.15, Edinburgh arr. 6.35 p.m.; in the opposite direction, Edinburgh 12.10 p.m., Berwick 1.24–1.29, York arr. 4.45.

Train services at stated intervals were introduced in the summer of 1911, the first to be so treated being the Newcastle-Middlesbrough section. An hourly express service left Newcastle from 8.17 a.m. to 8.17 p.m., and similarly from 8.20 a.m. to 8.20 p.m. from Middlesbrough. Between Newcastle and Sunderland an hourly service of stopping trains was provided, thus giving a half-hourly service, alternately fast and slow, between these points. The services from Newcastle to the Lake District, also North and South Wales, were benefited by this arrangement, and additional trains were included. The Whitby services were improved, resulting in a shorter journey time to and from London than had previously been possible. Through carriages between Halifax (Lancashire and Yorkshire Railway) and Bridlington were a notable innovation. Numerous other improvements have been made, including new stock for the 11.35 a.m. service from King's Cross for Scarborough and Whitby.

North Staffordshire Railway.

A new bogie corridor train was used in 1906 for the Derby and Potteries to Llandudno service. The following year another train was put on, this latter leaving Derby at 2 p.m. and then running *viâ* Crewe and Chester to North Wales. The return from Llandudno was fixed for 1.30 p.m. and Chester 3.17 p.m.

In 1908 the through services were extended by the running of trains between Stoke and Blackpool, also between Derby, Stoke, and Aberystwyth. The following summer saw the introduction of a through fast train between Stoke and Southport.

Somerset and Dorset Railway.

The 10.25 a.m. from Bath to Bournemouth was accelerated to make an improved

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connection at Templecombe with the up London and South Western express (due Waterloo 1.45 p.m.), thus saving 50 min. for passengers from Somerset and Dorset Junction stations.

A breakfast car having been provided on the 7.20 a.m. London and South Western train from Exeter, the first morning trains on the Somerset and Dorset Joint Line were now placed in connection with this train, which called at Templecombe at 8.51 a.m., enabling passengers to reach London one hour earlier. Other improvements were made in the service.

SOUTH EASTERN AND CHATHAM RAILWAY.

In July, 1906, Charing Cross station was re-opened, and the completion of this work enabled the Managing Committee to increase and revise the train services. Season by season the train services were improved and excellent new rolling stock was added. In April, 1910, Pullman cars of the latest type and luxuriously furnished were placed upon the London and Dover route to the Continent, and the innovation proving so popular, others were provided for the services running to and from Folkestone.

The night steamers from Queenborough to the Continent were transferred to Folkestone in May, 1911, consequently the trains in connection were modified to suit the new arrangements.

Last summer a new Continental service from Charing Cross at 4.30 p.m., booked in 90 minutes to Dover Pier, was inaugurated, and several other improvements in Continental facilities have been associated with this and other trains. During the last two or three years the various coast services have been consistently improved and accelerated, and one may mention specifically the new "Cliftonville" expresses to and from Margate and Ramsgate, and other 90 minute schedules between Victoria and Margate West.

A Modern Development of London Transport.

A LONDON GENERAL MOTOR OMNIBUS FOR EPSOM, CONNECTING WITH THE "TUBE" AND UNDERGROUND SYSTEMS AT CLAPHAM COMMON CITY AND SOUTH LONDON RAILWAY.

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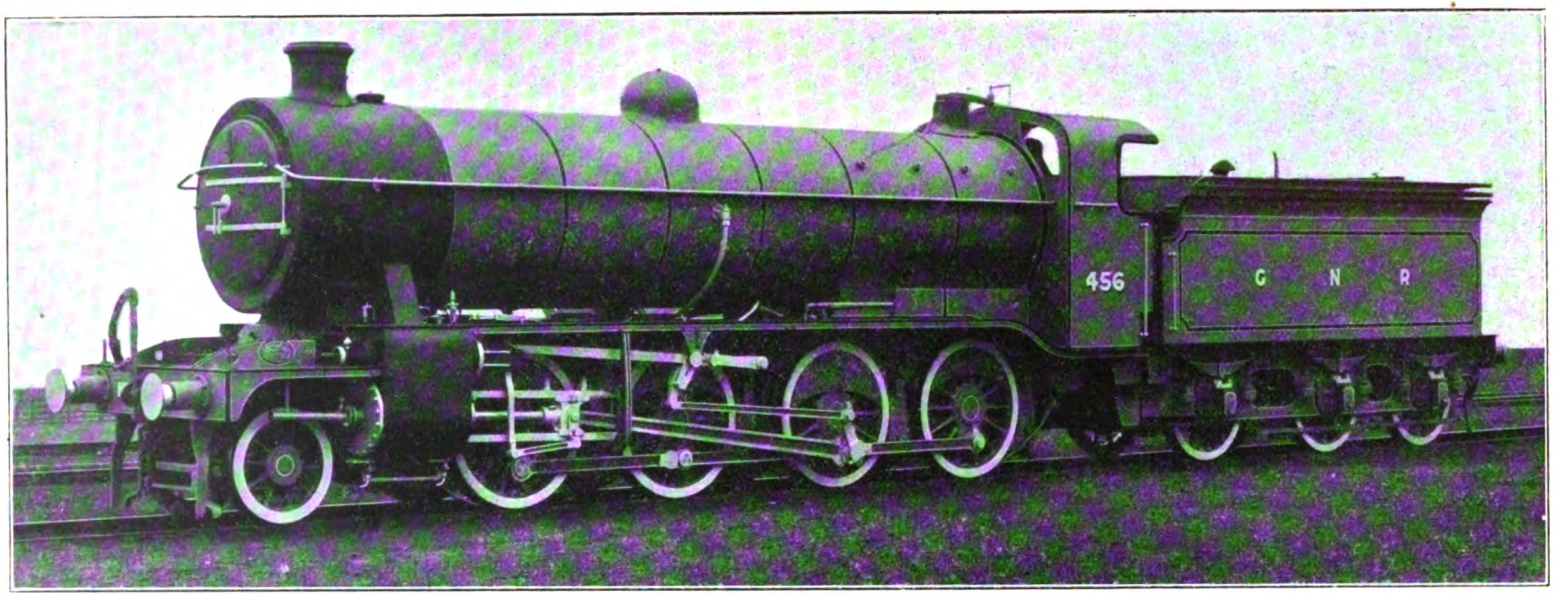
New 2-8-0 Superheater Mineral Locomotive : Great Northern Railway.

Designed by Mr. H. N. Gresley, Locomotive Engineer.



Mr. H. N. Gresley is placing in service on the Great Northern Railway a series of superheater (" Robinson " design) locomotives for heavy mineral traffic, of the " Consolidation " type, and we are now able to illustrate the first of these interesting engines. In many features they are suggestive of the 2–6–0 engines introduced last year for express goods traffic, with outside piston valve cylinders, Walschaert valve gear, and leading pony trucks, but otherwise include a larger boiler and characteristics of the 0–8–0 superheater engines already in use. The new engines are also interesting in that the " Weir " feed pump and feed water heater are included in the design, while two mechanical lubricators are employed instead of one as usual, respectively for the piston valves and cylinders and for the axle boxes of the coupled wheels. The new engines are known as the O–1 class.

Leading dimensions are as follows :—Cylinders, 21 in. by 28 in. ; coupled wheels, 4 ft. 8 in. diam. ; leading wheels, 3 ft. 2 in. diam. ; tender wheels, 4 ft. 2 in. diam. ; coupled wheelbase, 18 ft. 6 in. ; total engine wheelbase, 26 ft. 4 in. ; wheelbase, engine and tender, 51 ft. 6 in. ; total length over buffers, 60 ft. 11½ in. ; steam pressure, 170 lb. per sq. in. ; boiler barrel, 5 ft. 6 in. diam. ; length of barrel, 15 ft. 5 in. ; length of firebox, 9 ft. ; heating surface—tubes 1,922 sq. ft., firebox 162 sq. ft., superheater 157 sq. ft., total 2,654 sq. ft. ; grate area, 27 sq. ft. ; adhesion weight, working order, 67 tons 8 cwt. ; total weight, engine, working order, 76 tons 4 cwt. ; weight of tender, loaded, 43 tons 2 cwt. ; coal capacity, tender, 6½ tons ; water capacity, tender, 3,500 gallons.

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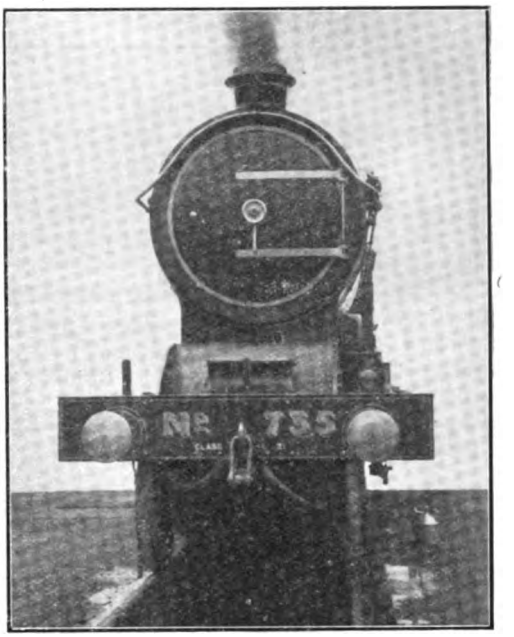
Eight Years of British Locomotive Practice.

By CECIL J. ALLEN.



Photo] [*R. J. Purves.*

NORTH EASTERN RAILWAY:
Three-cylinder simple 4–4–2 locomotive (Schmidt superheater) No. 735.

IT falls to my lot, in this "bi-centenary" number, to describe the locomotive developments which have taken place in these islands between October, 1905, and February, 1914—the period that has elapsed between the 100th and 200th issues of the RAILWAY MAGAZINE. In looking back over these years, one cannot fail to be reminded of those whose names were once household words in the locomotive world, but who, in this brief space, have "passed beyond our ken." First and foremost, one is compelled to think of the late Charles Rous-Marten, who conducted the "British Locomotive Practice and Performance" articles in this journal for over 6½ years, with an ability, an insight and an impartiality that together rendered him supreme in this particular sphere, until his sudden death in the spring of 1908; his most enduring monument will always be the deep and widespread interest in this subject to which his contributions gave birth. If this be the chief loss on the "Performance" side, "Practice" has been no less a loser. In June, 1906, Francis William Webb passed away, and in March, 1910, George Whale—two names that will indelibly be associated with two epochs in London and North Western locomotive history, on the pages of which the two men left so deep an impression. In January, 1912, Samuel Waite Johnson passed to his rest, after a long and honourable connection with the locomotive department of the Midland Railway, and then, last of all, Dugald Drummond, in December, 1912, who died "in harness," with whose genius and individuality practically the whole of the locomotive stock of the London and South Western Railway was stamped.

The list of retirements during the same eight years contains also many names by no means less famous. It is headed by that of Mr. James Holden, of locomotive oil-firing fame, who was succeeded on the Great Eastern Railway by his son, Mr. S. D. Holden, in January, 1908. In June, 1909, Mr. G. Whale was succeeded by Mr. C. J. Bowen Cooke as Chief Mechanical Engineer, London and North Western Railway. December of the same year witnessed the retirement of Mr. R. M. Deeley, of the Midland Railway—one of the few locomotive engineers in this country to support the compound principle of working—and the succession of Mr. H. Fowler. "Worsdell" locomotive history on the North Eastern Railway was brought to its conclusion in June, 1910, by the retirement of Mr. Wilson Worsdell from the post of Chief Mechanical Engineer, and his place was taken by Mr. Vincent L. Raven. Another noteworthy retirement

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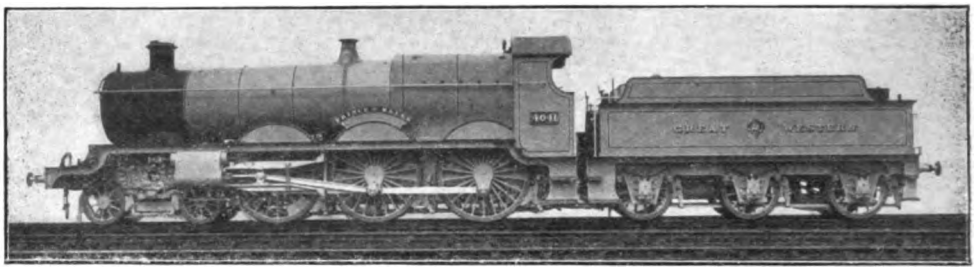
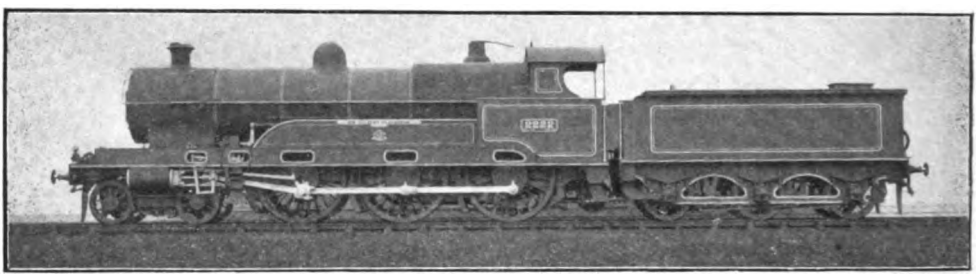
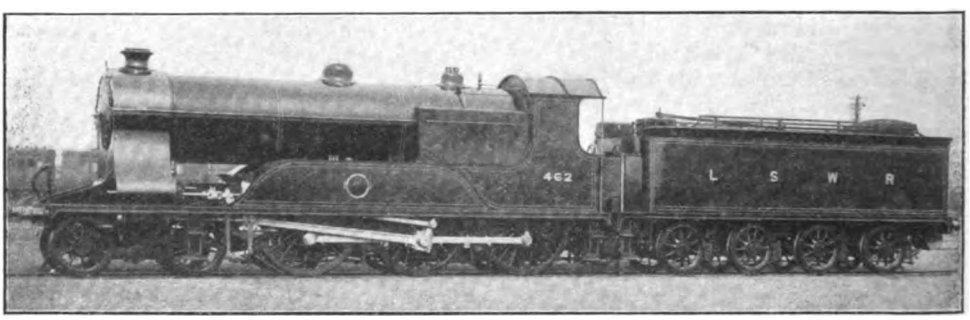


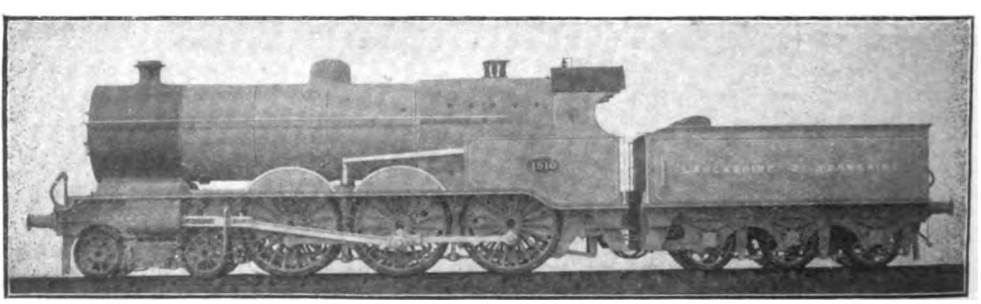
GREAT WESTERN RAILWAY: NO. 4041 *Prince of Wales.*
Designed by Mr. G. J. Churchward.
Four-cylinder Simple. Swindon Superheater. Walschaert valve gear.



LONDON AND NORTH WESTERN RAILWAY: NO. 2222 *Sir Gilbert Claughton.*
Designed by Mr. C. J. Bowen Cooke.
Four-cylinder Simple. Schmidt Superheater. Walschaert valve gear.



LONDON AND SOUTH WESTERN RAILWAY: NO. 6462.
Designed by the late Mr. Dugald Drummond.
Four-cylinder Simple. Drummond steam dryer. Walschaert valve gear.



LANCASHIRE AND YORKSHIRE RAILWAY: NO. 1510.
Designed by Mr. G. Hughes.
Four-cylinder Simple. Joy valve gear.

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during the period under review was that of Mr. H. A. Ivatt, who severed his long and honoured connection with the Great Northern Railway in October, 1911, and was succeeded by Mr. H. N. Gresley. Two months later Mr. L. Billinton inaugurated a second "Billinton" *régime* on the London, Brighton and South Coast Railway in succession to Mr. D. Earle Marsh. The year 1912 was one of several important changes. In February Mr. Peter Drummond came from the Highland Railway to succeed Mr. J. Manson on the Glasgow and South Western Railway, Mr. F. G. Smith following Mr. Drummond at Inverness; and in November Mr. A. J. Hill took over the reins of locomotive administration on the Great Eastern Railway from Mr. S. D. Holden, this being the second change on the Great Eastern Railway during the period under review. Finally, in December, the vacancy occasioned by the lamented death of Mr. Dugald Drummond was filled by the appointment of Mr. R. W. Urie. And now, right at the conclusion of these eight years, come further momentous changes. Mr. Harry S. Wainwright has yielded the government of the locomotive, carriage and wagon department of the South Eastern and Chatham Railway to Mr. R. E. L. Maunsell, of the Great Southern and Western Railway of Ireland, while the famous veteran of the Caledonian Railway—Mr. J. F. McIntosh—who has probably done more than any other locomotive engineer living to influence the general trend of design in this country, is also passing into retirement. The respective vacancies associated with these changes have been filled by the appointment of Mr. E. A. Watson to succeed Mr. Maunsell at Inchicore, while Mr. W. Pickersgill, who has for nearly twenty years had charge of the locomotive, carriage and wagon department of the Great North of Scotland Railway, is to succeed Mr. McIntosh at St. Rollox. Taking into account also many minor changes, the period between October, 1905, and February, 1914, has thus witnessed both the opening and closing of many important epochs in the history of locomotive design in this country.

It would be difficult to state in brief the distinguishing developments in design during this period, but certain of them stand out from others. Principal among these is undoubtedly the use of superheated steam, which has been taken up with a truly remarkable unanimity by locomotive engineers all over the British Isles. On the Great Western Railway—the pioneer line in this direction—all locomotives are rapidly being fitted with the Swindon superheater, without distinction of class or type. On the London and North Western Railway the Schmidt apparatus is supreme, virtually all Mr. Bowen Cooke's engines of suitable classes being so fitted. The North Eastern Railway is equipping all new engines with either the Schmidt or the Robinson superheater, and is rebuilding numbers of express engines of earlier types with superheating apparatus. On the Great Central Railway the Robinson superheater is exclusively in evidence, and is fitted to all new types, while on the Great Northern Railway superheating is now generally adopted, usually with the Schmidt apparatus. The latter companies have not, however, equipped existing types with superheaters to the same extent as have the Great Western and North Eastern authorities, although they are now commencing to do so. Conversely, on the Midland system virtually all the superheaters in use have been fitted to existing engines, which have been rebuilt for the purpose, a few goods engines alone having been built with this equipment. On the Lancashire and Yorkshire Railway the Schmidt apparatus is extensively employed, both for new and rebuilt engines; but Mr. Hughes is also employing the Horwich superheater, in two forms, for certain recent engines. On other British lines the superheater is also being widely adopted, though in most cases, except perhaps on the Caledonian and London, Brighton and South Coast Railways, the numbers of engines so fitted are not, as yet, very great.

Generally speaking, however, every new express passenger and goods locomotive type that appears in this country is superheater-equipped, and also every tank-engine type intended for main line operation. On the other hand, we have to note the decay of compounding, only one line—the Midland—having given the question serious consideration during this eight years, while on other lines many compound engines in use have been either converted to simple expansion or scrapped. As has been previously indicated in these columns, the cheapness of coal in this country has probably neutralised any economy to be effected in this direction; be that as it may, beyond the 40 compound express engines constructed by the Midland Company since October, 1905, the number of compound locomotives built or purchased experimentally during the same period by the Great Western, Great Northern, Great

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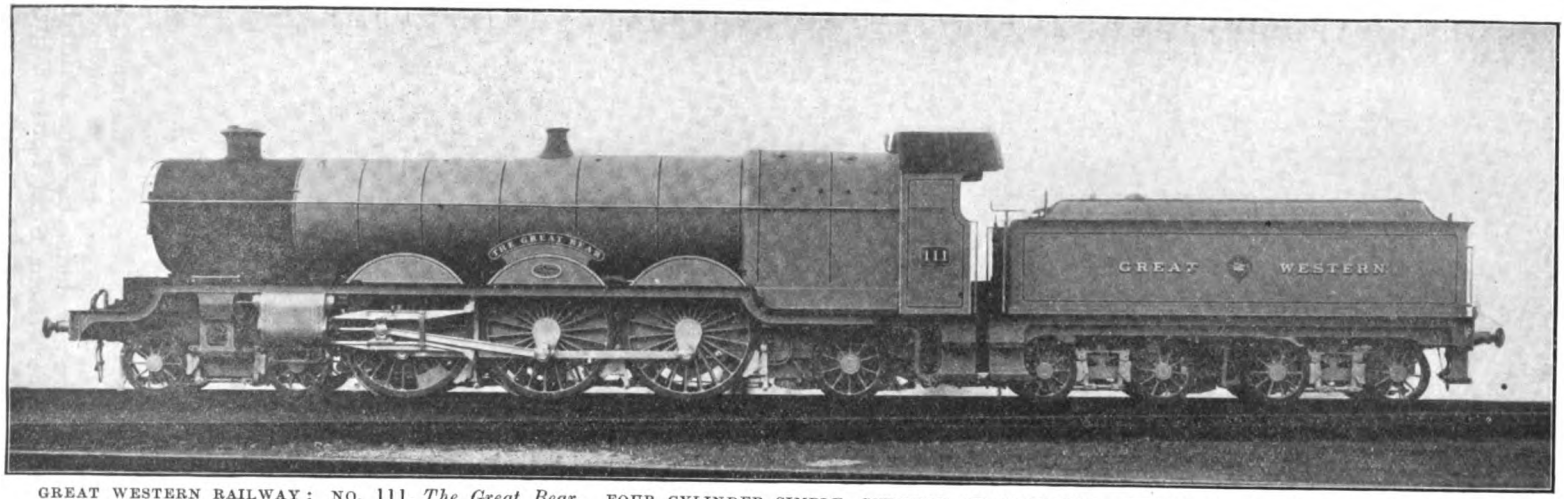
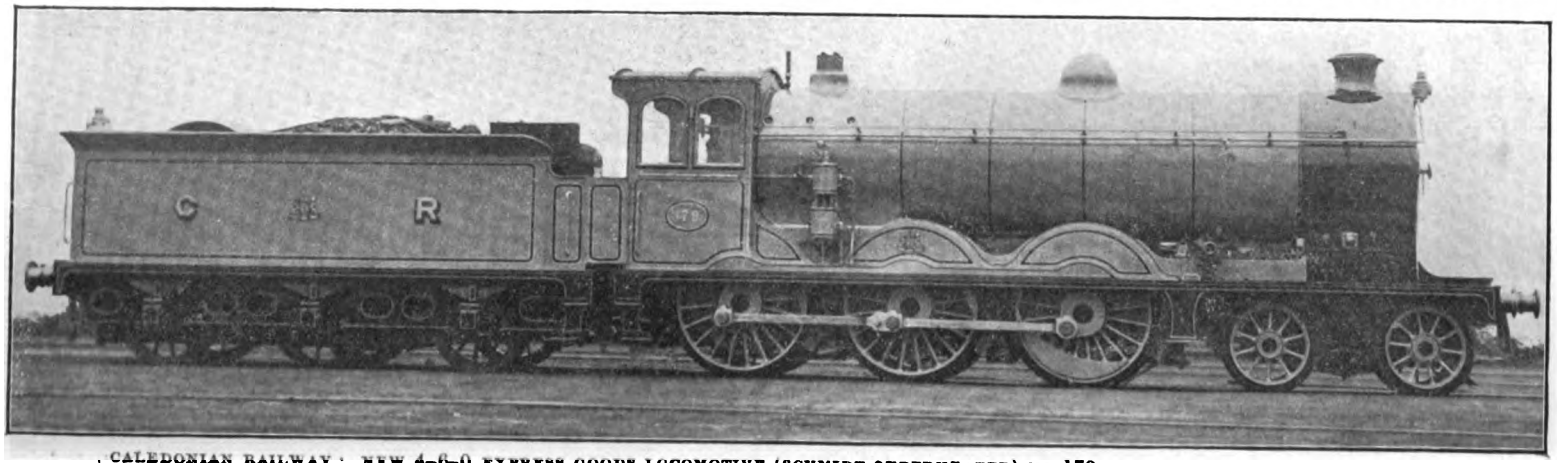


GREAT WESTERN RAILWAY: NO. 111, *The Great Bear.* FOUR CYLINDER SIMPLE, SWINDON SUPERHEATER. DESIGNED BY MR. G. J. CHURCHWARD.



CALEDONIAN RAILWAY: NEW 4-6-0 EXPRESS GOODS LOCOMOTIVE (SCHMIDT SUPERHEATER) NO 179. DESIGNED BY MR. J. F. MCINTOSH.

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Central, Lancashire and Yorkshire and North Eastern lines barely totals a round score, though it is only fair to record the unquestioned success of the French compounds on the Great Western and the Great Central and North Eastern compound " Atlantics." Recently the Midland Company has equipped No. 1040—a 3-cylinder compound 4–4–0 engine—with superheating apparatus and one or more of the Great Central compounds have also been so fitted. It is rumoured that the North Eastern may similarly adapt Nos. 730 and 731—the two large 4–4–2 4-cylinder compounds; such experiments will be watched with interest, but he would be a sanguine man indeed who would prophesy a recrudescence of compounding in the British Isles, even in conjunction with superheating.

While the principle of compounding has decayed, however, the eight years under review have witnessed no small development in the matter of multi-cylinder arrangements for high pressure steam. As loads and scheduled speeds have increased, it has been a correspondingly growing difficulty to arrange a pair of cylinders either inside or outside the frames of a size adequate to the steam-producing powers of modern locomotive boilers, more especially since the introduction of superheaters. In some cases two cylinders of exceptional diameter have been employed, as, for example, the 21½ in. cylinders of the 4–6–0 Great Central " Sir Sam Fay " and " Glenalmond " classes, but most locomotive engineers have preferred the use of three or four cylinders, two outside and one or two inside the frames, with the superior facilities for balancing the engine thus afforded. Experimental engines thus arranged prior to 1905 will be remembered: there was No. 11, a 4–4–0 engine of Mr. Manson's design, on the Glasgow and South Western Railway; a 4–4–0 engine of the " Jubilee " type on the London and North Western Railway, built by Mr. F. W. Webb as a 4-cylinder simple engine, but early converted to a compound in conformity with the other engines of the same type; and Mr. Ivatt's " Atlantic " No. 271 on the Great Northern Railway; and there were also the familiar engines of the 4–2–2–0 type, with uncoupled driving wheels, designed by Mr. D. Drummond for the London and South Western Railway. It was found, however, that with all the engines enumerated the boiler of the period was hopelessly inadequate as regards steam-producing power, to supply four cylinders at high pressure, and the London and South Western engines, which are still running have only been rendered efficient by means of successive processes of lining up the cylinders to a much smaller diameter—from 15 in., to, I believe, 14 in.

Consequently, multi-cylinder high pressure arrangements were only in an experimental stage—and an unsatisfactory one at that—when Mr. Churchward " pioneered " on the Great Western Railway in 1906 with the 4–4–2 engine No. 40 *North Star*, having four cylinders 14½ in. diameter and 26 in. stroke. 4–6–0 engines of the same cylinder arrangement followed rapidly on the Great Western Railway, and the success of this method of propulsion was then assured. In the same year the late Mr. D. Drummond made a further experiment in the matter of 4-cylinder working with high pressure steam, introducing five 4–6–0 engines on the London and South Western Railway of vast size, even as judged by present standards, and of whose boilers no complaint could be made as to inadequacy in steam production. Indeed, the majority of the subsequent 4–6–0 4-cylinder engines on the London and South Western Railway have been designed with boilers of reduced diameter, the pioneer engines being mostly confined to express goods service. The next line to follow suit in the matter of four high pressure cylinders was the Lancashire and Yorkshire Railway in 1909, Mr. Hughes in that year building at Horwich a series of 20 large 4–6–0 4-cylinder engines, while during the year just past Mr. C. J. Bowen Cooke, of the London and North Western Railway, has turned out his famous 4-cylinder 4–6–0 " Claughton " class, whose performances are already on the way to becoming historic. It will be noticed, therefore, that all the 4-cylinder engines built between October, 1905, and February, 1914, have been of the 4–6–0 wheel arrangement (with the sole exception of the pioneer Great Western 4–4–2 engine *North Star*, which has since been converted to a 4–6–0) and all are intended in the first instance for express service.

Mainly under the ægis of Mr. V. L. Raven, of the North Eastern Railway, a similar development has been taking place in the direction of 3-cylinder high pressure propulsion, which is said to afford a more uniform turning effort and better balancing to the engine than even the 4-cylinder arrangement. The earliest engine on this principle was Mr. James Holden's famous " Decapod " tank of 1903, which had three high-pressure cylinders, 18½ in. diameter by

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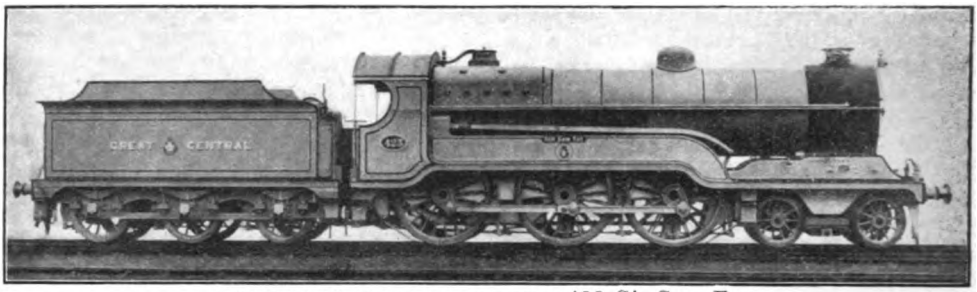
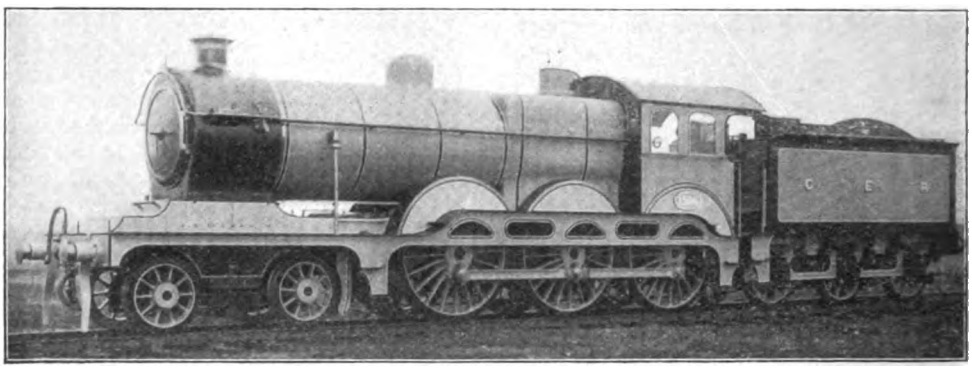
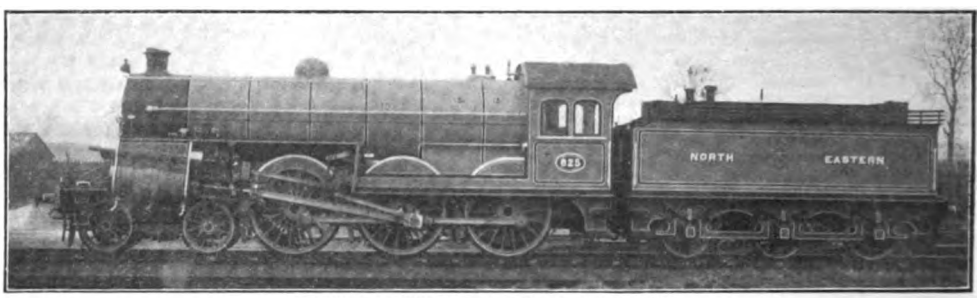


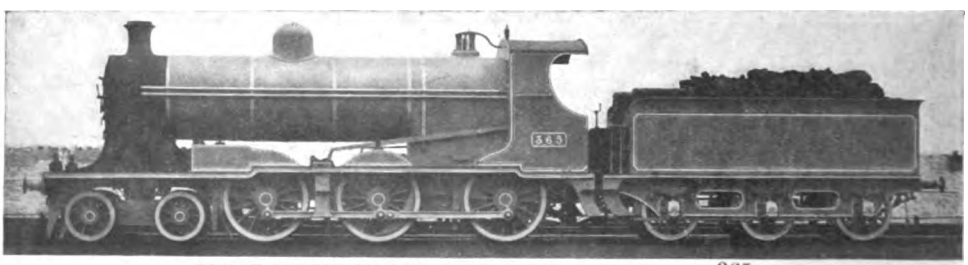
GREAT CENTRAL RAILWAY: NO. 423 *Sir Sam Fay.*
Designed by Mr. J. G. Robinson.
"Robinson" superheater.



GREAT EASTERN RAILWAY: NO. 1506.
Mr. A. J. Hill, Locomotive Engineer.
Schmidt superheater.



NORTH EASTERN RAILWAY: NO. 825.
Designed by Mr. V. L. Raven.
"Stumpf" cylinders. Walschaert valve gear. "Robinson" superheater.



GREAT SOUTHERN AND WESTERN RAILWAY: NO. 365.
Designed by Mr. R. Coey.
The only 4–6–0 standard class in Ireland.

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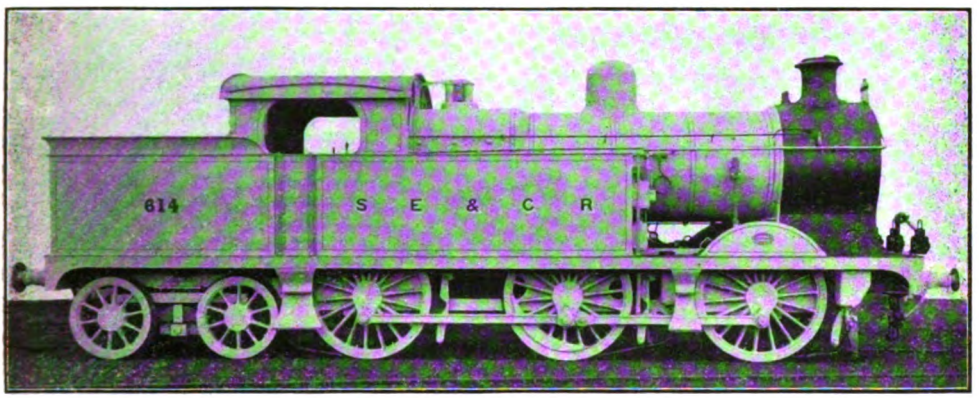
24 in. stroke, but, after the conversion of this engine to the 0–8–0 wheel arrangement with tender in 1906, nothing further was done in the matter of 3-cylinder propulsion until 1907, when Mr. J. G. Robinson introduced his three large 0–8–4 type banking engines for use in Wath marshalling yard, which were so equipped. He followed this up by rebuilding experimentally No. 1090—a standard 4–4–2 type express engine—with three high-pressure cylinders 15⅞ in. diameter by 26 in. stroke, in order to institute comparisons with the standard 2-cylinder simple and the four 3-cylinder compound "Atlantics," but, although the engine's performances have always been in the highest degree satisfactory, no further steps have been taken in this direction on the Great Central Railway. On the North Eastern Railway, however, 3-cylinder propulsion is becoming increasingly popular. The first engines on the North Eastern Railway to be so equipped were four 4–8–0 tank engines, intended, as in the case of the Great Central Railway, for use in gravity marshalling yards. The engines have cylinders 18 in. diameter by 26 in. stroke, and were designed and built under the superintendence of Mr. Wilson Worsdell in 1909. Late in 1910 the same principle was embodied by Mr. V. L. Raven in the design of a large 4–6–2 tank engine, intended for mineral service, of which 20 have been built with cylinders 16½ in. diameter by 26 in. stroke. The next step was the construction of the 20 well-known 4–4–2 3-cylinder engines, 10 of which are superheated and fitted with cylinders 16½ in. diameter by 26 in. stroke, while the remaining 10 use saturated steam, and have cylinders 15½ in. diameter by 26 in. stroke. All these engines give the greatest satisfaction. The latest development has been the construction of twenty 3-cylinder passenger tank engines of the 4–4–4 wheel arrangement, having superheaters, and cylinders 16½ in. diameter by 26 in. stroke. Multi-cylinder high-pressure arrangements have, therefore, made good progress during the eight years under review, although, curiously enough, they have not been applied yet in any instance to any express goods engine.



SOUTH EASTERN AND CHATHAM RAILWAY: NEW 0–6–4 TANK ENGINE.
Designed by Mr. H. S. Wainwright.

These engines are developments of the larger 0–4–4 tank engines already in service, but include Schmidt superheaters, increased boiler dimensions, large bunker, and other changes. The firebox is of Belpaire type—a novelty as regards tank engines on this line. Piston valves above the cylinders are operated through rocking shafts from the ordinary link motion. Leading dimensions are: Cylinders, 19½ in. by 26 in.; piston valve, 8 in. diam.; coupled wheels, 5 ft. 6 in. diam.; bogie wheels, 3 ft. 7 in. diam.; coupled wheelbase, 16 ft. 6 in.; total wheelbase, 27 ft. 9 in.; length over buffers, 39 ft. 6⅝ in.; steam pressure, 160 lb. per sq. in.; total heating surface, 1,297 sq. ft.; grate area, 17.6 sq. ft.; water capacity, 2,000 gallons; coal capacity, 2½ tons; weight in working order, 70 tons 14 cwt.

While referring to the question of cylinders, a few remarks may be devoted to their position, which has undergone considerable change during recent years. With the exception of compound engines having more than two cylinders, the locomotives introduced during the decade prior to that under review had been almost entirely of inside cylinder types. With the introduction of 10-wheeled passenger engines and 8-coupled mineral engines, however, many companies found it inconvenient to drive inside on the first or second coupled axle, owing to the shortness of connecting rod thereby entailed, and outside cylinder types, driving on the

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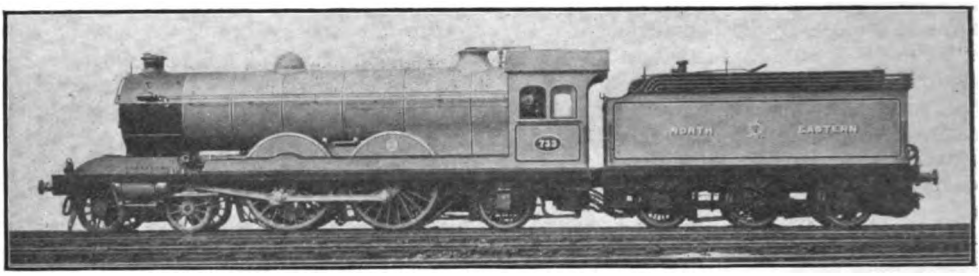
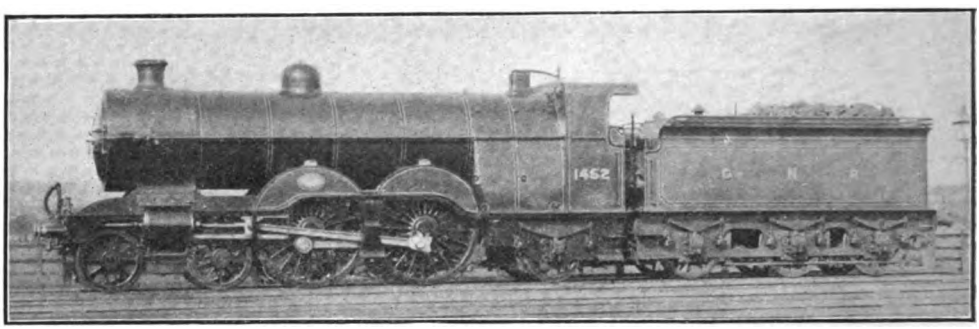
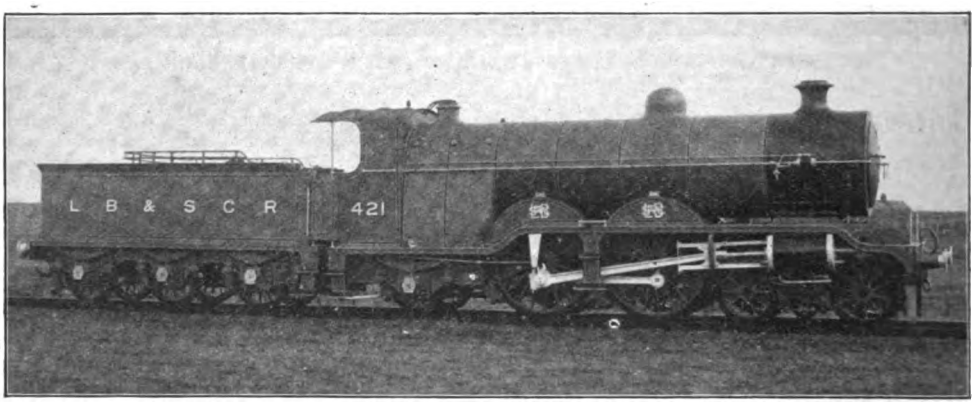


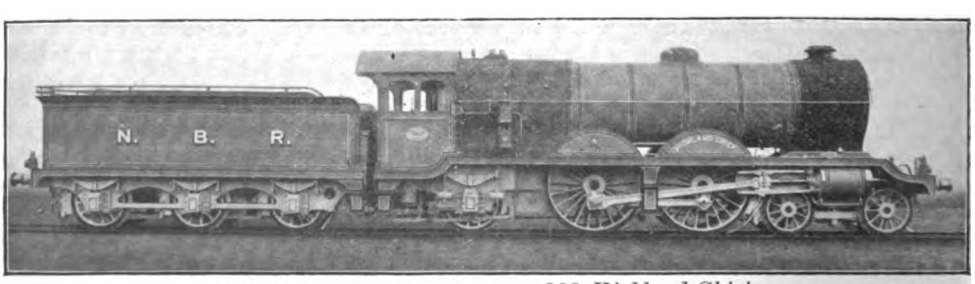
NORTH EASTERN RAILWAY: NO. 733.
Designed by Mr. Vincent L. Raven.
Three cylinder Simple. Schmidt superheater.



GREAT NORTHERN RAILWAY: NO. 1452.
Designed by Mr. H. A. Ivatt.
Schmidt superheater.



LONDON, BRIGHTON AND SOUTH COAST RAILWAY: NO. 421.
Designed by Mr. D. Earle Marsh.
Schmidt superheater.



NORTH BRITISH RAILWAY: NO. 902 *Highland Chief*.
Designed by Mr. W. P. Reid.

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second or third axle, had already begun to appear by the end of 1905, such as 4–6–0 and 2–8–0 engines on the Great Western Railway, 4–6–0, 4–4–2 and 0–8–0 engines on the North Eastern Railway, 4–4–2, 4–6–0 and 0–8–0 engines on the Great Central Railway, 4–4–2 engines on the Great Northern Railway, and 4–6–0 engines on the Glasgow and South Western and Highland Railways. Since that date several of the railways mentioned have definitely adopted outside cylinder propulsion, the most important of these being the Great Western Railway, which has built large numbers of 4–6–0, 4–4–0, 2–8–0 and 2–6–0 tender engines and also 4–4–2, 2–6–2, and 2–8–0 tank engines, all with outside cylinders, while at the same time scarcely any new inside cylinder engines have been turned out at Swindon. Conversely Mr. Robinson, on the Great Central Railway, has reverted to inside cylinders in his latest 4–6–0 engines, while some lines, as the Caledonian, Great Eastern, and South Eastern and Chatham Railways, have adhered for very many years uniformly to inside-cylinder practice. Most of the engines built on the North Eastern Railway during the past few years have been fitted with outside cylinders, mainly on account of multi-cylinder arrangements which render this necessary, while recent Great Northern practice also trends in the direction of outside cylinder arrangement. The Midland and London and North Western Companies, however, favour inside cylinder propulsion, only departing from this standard constructional practice in the case of engines having 3 or more cylinders, of which the sole types built during the past 8 years have been the Midland 4–4–0 compounds, and the London and North Western 4–6–0 " Claughton " class. The practice on other lines has mainly been in the direction of inside cylinders, the outside position having only been adopted where considered absolutely necessary.

The next question to claim attention, and, I think it might be fairly said, that which constitutes the most popular and easily understood feature of locomotive design, is the question of wheel arrangements. For convenience it is well to deal with developments in this direction under four headings —express passenger locomotives; mixed traffic locomotives, intended for heavy excursion or express goods service; goods and mineral locomotives; and tank locomotives. As regards the first class, no new wheel arrangements have been introduced in this country since 1905, with the sole exception of Mr. G. J. Churchward's *magnum opus* —the 4–6–2 4-cylinder express engine No. 111, *The Great Bear*—which was added to the Great Western locomotive stock early in 1908. Judging, however, by the performances of the standard 4–6–0 engines of the same company, which seem capable of dealing successfully with any load at the high scheduled speeds in force on the Great Western Railway—as *vide* my own experience detailed in last month's issue—it would appear that this remarkable machine is in advance of her time, and the type has not multiplied. It may be said that, at the close of 1905, the speeds of express trains in this country had, generally speaking, reached their zenith, and from that time to this they have remained more or less stationary. On the other hand, the vast increase of travelling, together with the constantly improving facilities afforded, as embodied in corridors, lavatories, restaurant and sleeping cars, has throughout this period increased the weight of express trains, so that the developments of locomotive power have been not so much in the direction of speed as in that of weight haulage.

This increased capacity for haulage has been secured, in most instances, by increasing the number of coupled axles from two to three, and by utilising the correspondingly increased adhesion weight in the amplification of cylinder dimensions. In October, 1905, the companies using 4–6–0 type engines for express passenger service were the North Eastern, Great Central, Great Western, London and North Western, Caledonian, Glasgow and South Western and Highland Railways. The first-named was probably, at the time, the largest user, but had just previously introduced the first 10 engines of the " Atlantic," or 4–4–2 type, and, as the latter wheel arrangement has been multiplied, the 4–6–0 engines have been relegated mainly to express goods service. On the Great Western and London and North Western Railways the 4–6–0 wheel arrangement was more or less in an experimental stage in October, 1905, but has since then, on both systems, " multiplied exceedingly." On the Great Western Railway two distinct types have been built, the 2-cylinder engines not differing in any marked degree from the pioneer 4–6–0 express engines, No. 100, *William Dean*, No. 98 and No. 171, *Albion*, already in service, while the first of the 4-cylinder series was introduced in 1906, and the type has similarly proved very popular. Not only so, but all the " Atlantic "

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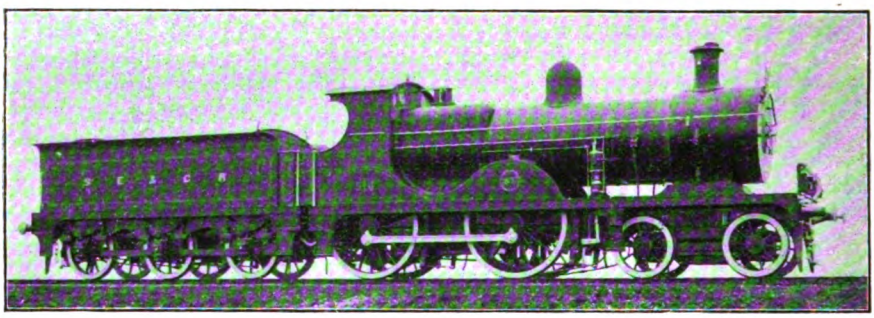
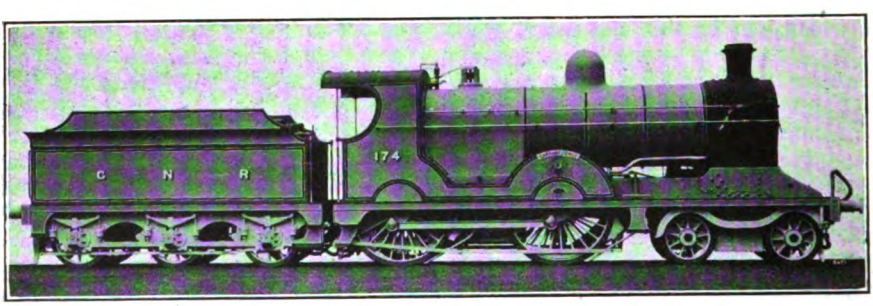
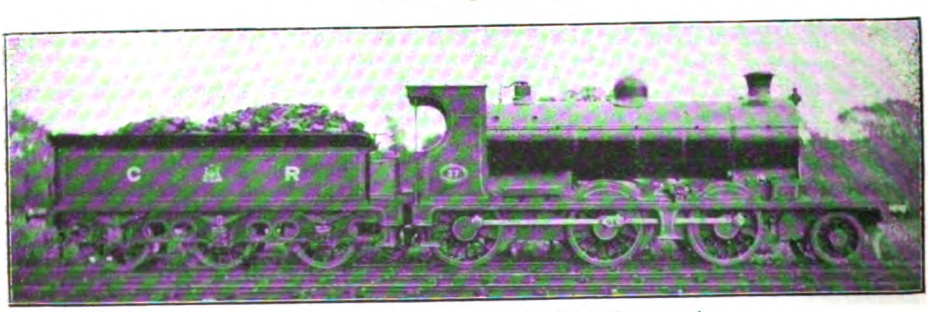
MIDLAND RAILWAY: No. 990.
Designed by Mr. R. M. Deeley.
Deeley valve gear. Rebuilt with Schmidt superheater.



SOUTH EASTERN AND CHATHAM RAILWAY: NO. 516.
Designed by Mr. H. S. Wainwright.



GREAT NORTHERN RAILWAY OF IRELAND: NO. 174 *Carrantuohill.*
Mr. J. Glover, Locomotive Engineer.
Schmidt superheater.



CALEDONIAN RAILWAY: NO. 37 (2–6–0 CLASS).
Designed by Mr. J. F. McIntosh.
Schmidt Superheater.

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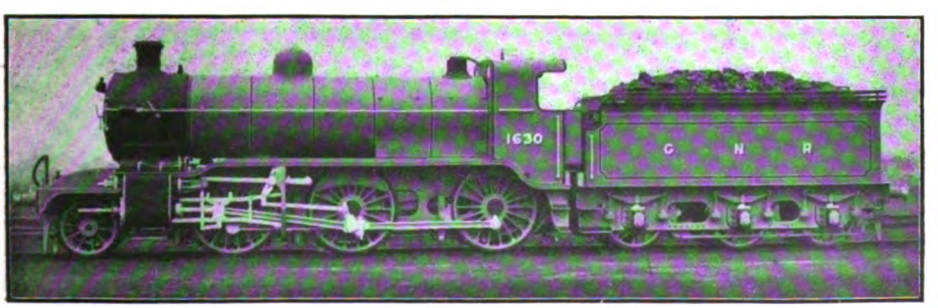
GREAT WESTERN RAILWAY: NO. 4331.
Designed by Mr. G. J. Churchward.
Swindon superheater.

type engines built for the Great Western Railway, with the exception of the three French compounds, have been converted to the 4–6–0 arrangement. On the London and North Western Railway, in October, 1905, the "Experiment" 4–6–0 type had just been introduced, and justified its existence to such an extent that large numbers of these engines have been built between that date and the present, and are, indeed, still being added, with the addition of Schmidt superheaters. The first engine of the superheater class, No. 819, *Prince of Wales*, appeared in 1911. And now, finally, a further 4–6–0 type has made its appearance on the London and North Western Railway, this time with four high-pressure cylinders and greatly increased dimensions —the "Claughton" class of 1913.

On the three Scotch lines mentioned the passing of eight years has witnessed an increase of 4–6–0 engines of existing types, without any appreciable modification of dimensions, or noticeable alteration, other than the addition of superheaters to all the Caledonian 4–6–0 express engines, and the building of two new Glasgow and South Western 4–6–0 engines—Nos. 128 and 129 —in 1911, with superheating apparatus. The Great Central Railway has, however, introduced an entirely new 4–6–0 type of vast dimensions during 1913, the pioneer engine being No. 423, *Sir Sam Fay*, which would seem to indicate a possible reversion on the part of that company from 4–4–2 to 4–6–0 construction, for express passenger service, in the future. Apart from all these lines, moreover, three companies have, during the period under review, introduced the 4–6–0 wheel arrangement for the first time—the London and South Western Railway in 1906, the Lancashire and Yorkshire Railway in 1909, and the Great Eastern Railway in 1912. On the London and South Western Railway three main classes have been built—the large-boilered 6 ft. engines, now working mostly on express goods service, the smaller-boilered 6 ft. engines, intended primarily for the Salisbury-Exeter express service, and the big 6 ft. 7 in. type of 1911, built in view of the accelerated Bournemouth services of that year. All these engines have the four-cylinder arrangement, but yet a fourth type, in this instance with two outside cylinders only, is now under construction, designed mainly for mixed



GREAT NORTHERN RAILWAY: NO. 1630.
Designed by Mr. H. N. Gresley.
Schmidt superheater. Walschaert valve gear.

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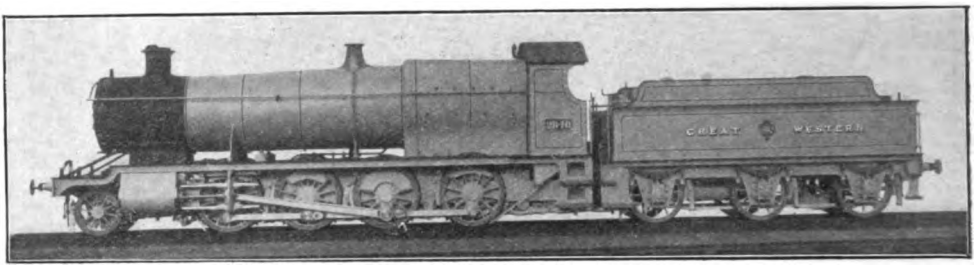
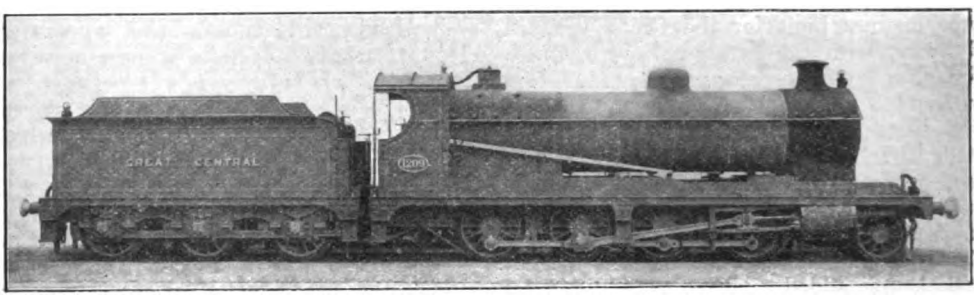
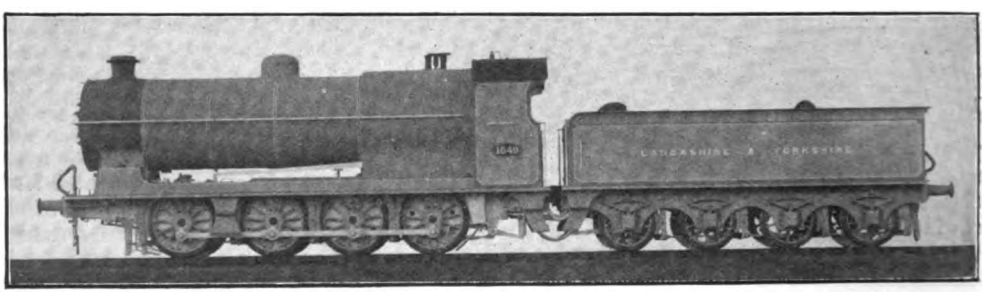


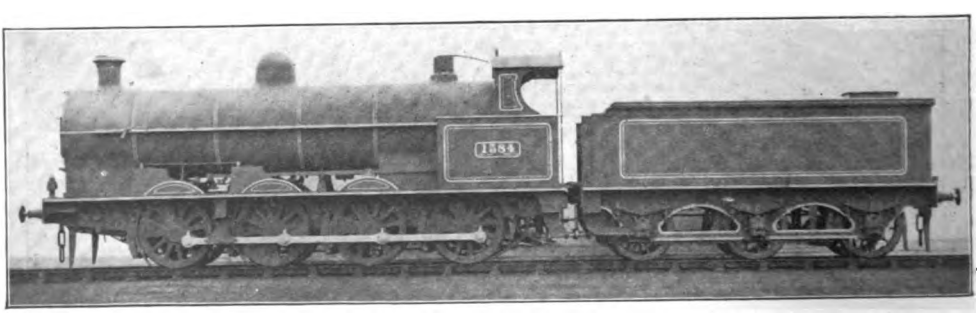
GREAT WESTERN RAILWAY : NO. 2840.
Designed by Mr. G. J. Churchward.
Swindon superheater.



GREAT CENTRAL RAILWAY : NO. 1209.
Designed by Mr. J. G. Robinson.
" Robinson " superheater.



LANCASHIRE AND YORKSHIRE RAILWAY : NO. 1549.
Designed by Mr. G. Hughes.
" Horwich " superheater.



LONDON AND NORTH WESTERN RAILWAY : NO. 1384.
Designed by Mr. C. J. Bowen Cooke.
Schmidt superheater.

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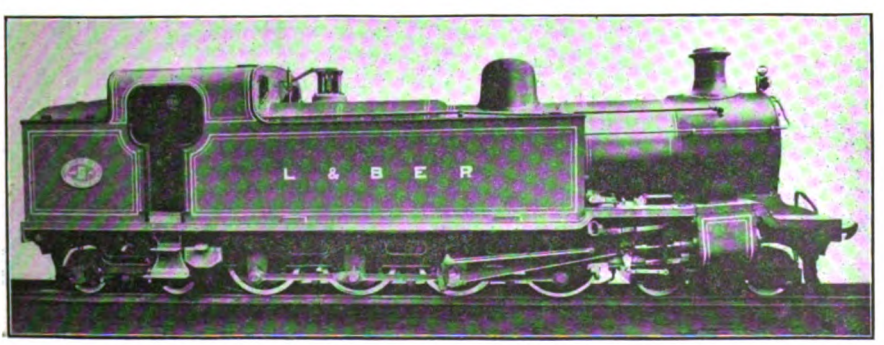
LONDON, BRIGHTON AND SOUTH COAST RAILWAY : NO. 337.
Designed by Mr. L. Billinton.

traffic working. The Lancashire and Yorkshire 4–6–0 engines are also of the 4-cylinder type, and are of interest in that they demonstrate a third example of reversion from the 4–4–2 to the 4–6–0 type of engine for express service. The Great Eastern 4–6–0 engines —in outline a development of the existing 4–4–0 " Claud Hamilton " type—have long been needed on that line, and have so amply demonstrated their worth that the number has been increased from 5 to 20. Eleven companies, therefore, use express locomotives of the 4–6–0 type, and the total number of engines of this wheel arrangement in the country must now considerably exceed 500, whereas the type was still in its infancy in 1905.

The " Atlantic " type of locomotive, however, has not found similar favour, and its use is confined to seven lines, on five of which engines of the 4–4–2 arrangement were in use prior to 1905 —the Great Northern, Great Central, Great Western, North Eastern and Lancashire and Yorkshire. In 1906 two further companies were added to the list—the North British, who built 14 4–4–2 engines in conformity with prevailing East Coast practice, and the London, Brighton and South Coast, whose locomotive superintendent had lately come from the Great Northern Railway, and who himself adopted a very similar design for the five engines built at Brighton. At present the East Coast companies—the Great Northern Railway, North Eastern Railway and North British Railway—are the chief users of " Atlantic " engines, and own between them 167 of the two hundred odd engines of this class now running in these islands. The only other new types coming within our purview are the 10 superheater " Atlantics " of the Great Northern Railway, built in 1910, and the 3-cylinder " Atlantics " of the North Eastern Railway, 20 in number, which were put into service in 1911, although mention should also be made of the two 4-cylinder compound " Atlantics " which the North Eastern Railway built experimentally in 1906. The North British Company has built a second batch of 4–4–2 engines, bringing the total number to 20, and the London, Brighton and South Coast Railway has added to the original five " Atlantic " engines of 1906 a further series of five in 1911, fitted with Schmidt superheaters. Thus the " Atlantic " type of engine does not seem likely to figure much among the designs of the future, in just the same way as the single-driver, of which type no examples whatever have



LONDONDERRY AND LOUGH SWILLY RAILWAY (BURTONPORT EXTENSION) : NO. 5.
Designed by Mr. I. Sutcliffe.
Built by Messrs. Hudswell, Clarke & Co., Ltd.

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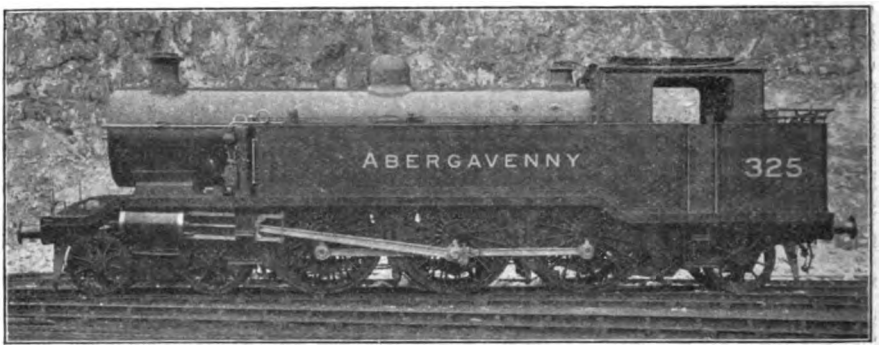
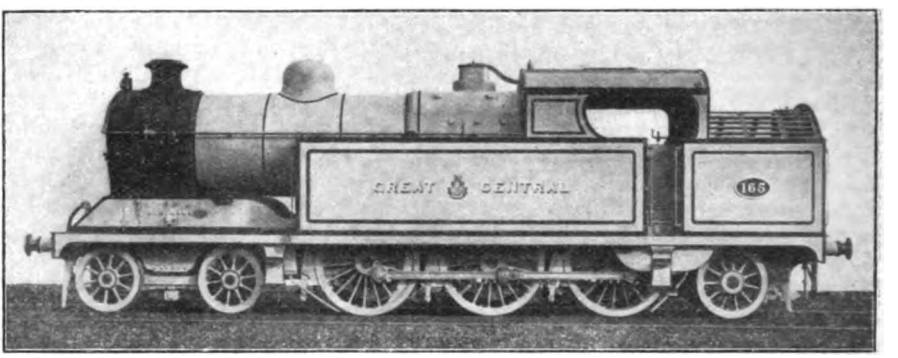
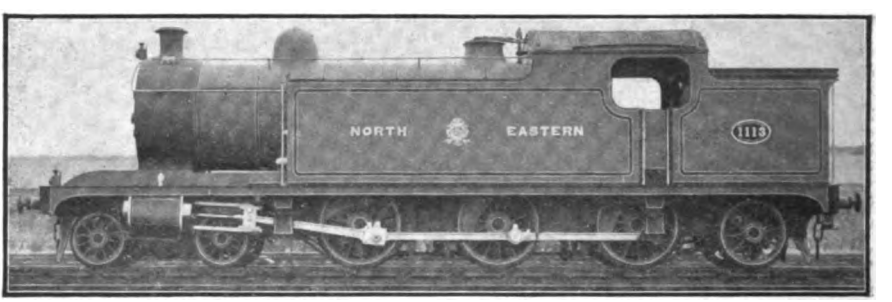


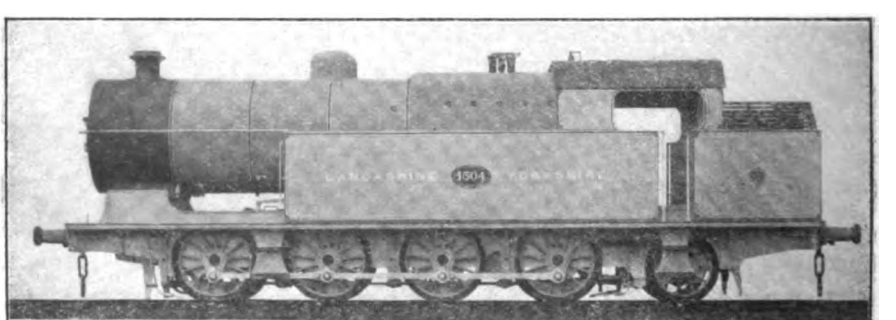
LONDON, BRIGHTON AND SOUTH COAST RAILWAY: NO. 325 *Abergavenny*.
Designed by Mr. D. Earle Marsh.
Schmidt superheater. Weir feed pump.



GREAT CENTRAL RAILWAY: NO. 165.
Designed by Mr. J. G. Robinson.
Robinson superheater.



NORTH EASTERN RAILWAY: NO. 1113.
Designed by Mr. V. L. Raven.
Three-cylinder simple.



LANCASHIRE AND YORKSHIRE RAILWAY: NO. 1504.
Designed by Mr. G. Hughes.

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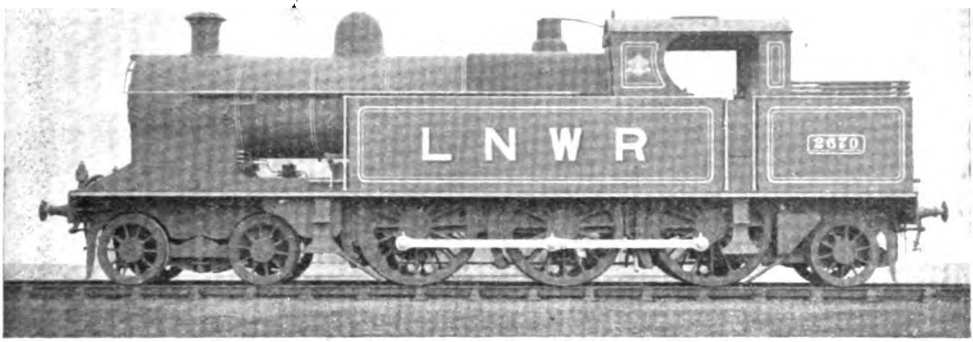
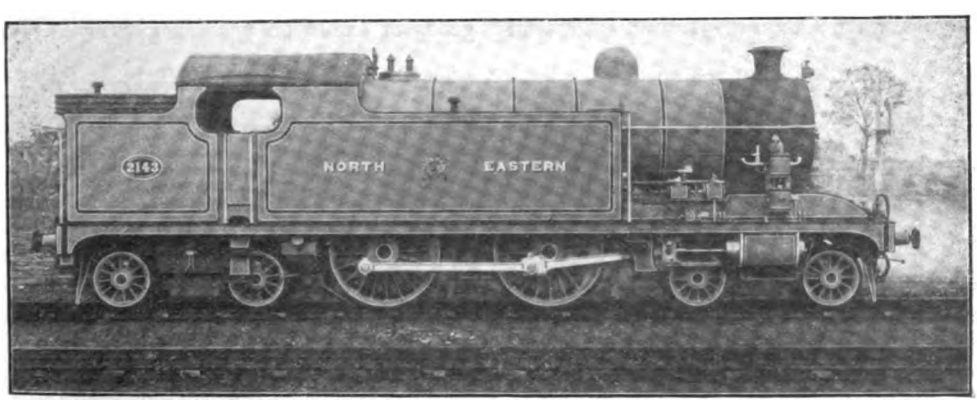


LONDON AND NORTH WESTERN RAILWAY : NO. 2670.
Designed by Mr. C. J. Bowen Cooke.
Schmidt superheater.

been built during these eight years, is rapidly becoming obsolete.

The favourite British type of locomotive for all-round main line express service is still that having the 4–4–0 wheel arrangement, which was the standard type on almost every line at the end of 1905, and of which some noteworthy designs have been evolved, even of recent years. On the London and North Western Railway No. 513, *Precursor*, had appeared in 1904, and engines of this type were built extensively in the years following, until the advent of the superheater 4–4–0 No. 2663, *George the Fifth*, in 1910. On the Great Western Railway the "County" class comes within our period, the first of these engines appearing in 1907, and constituting the only modern example of a simple 4–4–0 engine with outside cylinders. In the same year the Midland Company produced the 999 class of 4–4–0 engines, very similar in general dimensions to the Deeley compounds of 1906, save for driving wheels 6 ft. 6 in. diameter in place of 7 ft. These engines have now been fitted with superheaters, and work mainly between Leeds and Carlisle. In 1908 the North Eastern Railway brought out the remarkable R1 class, these being among the largest and heaviest 4–4–0 engines ever built; most of these engines are also now superheater-fitted. The advent of superheating has also been responsible for the design of quite a number of entirely new 4–4–0 types of quite exceptional power during recent years. Chief among these are the new 429 class of 10 engines on the Great Central Railway, of which the pioneer has the name *Sir Alexander Henderson*, and the 341 class on the Great Southern and Western Railway of



NORTH EASTERN RAILWAY : NO. 2143.
Designed by Mr. V. L. Raven.
Three-cylinder simple. Schmidt superheater.

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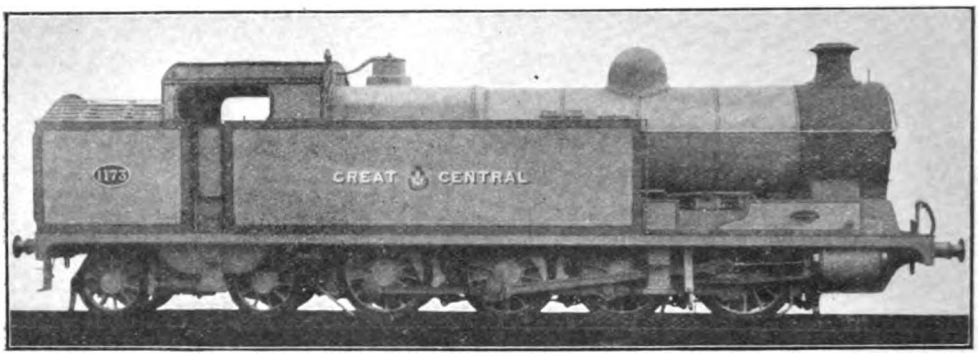
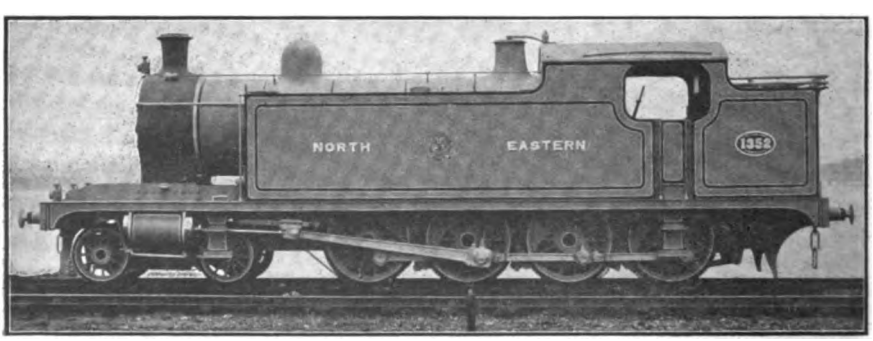


GREAT CENTRAL RAILWAY: NO. 1173.
Designed by Mr. J. G. Robinson.
Three-cylinder simple.

Ireland, No. 341 being called *Sir William Goulding*, both built during 1913, and superheater-fitted. Among other large 4–4–0 engines of new types may be mentioned the 51 class on the Great Northern Railway, built in 1911, the 463 class on the London and South Western Railway, built in 1912, the powerful new 6 ft. engines for the Greenock service on the Glasgow and South Western Railway, built in 1913, the recent North British 4–4–0 types and new 4–4–0 superheater engines on the Great Northern Railway of Ireland. Allegiance to the 4–4–0 wheel arrangement, therefore, is evidently as strong as ever in this country.

As regards engines for mixed traffic service notable strides have been made, and various types have been built. Among those of the 4–6–0 type the most numerous have been the London and North Western 5 ft. 3 in. engines, introduced in 1907, the Great Central 1113, or "Fish" class, of the same year, and the North Eastern 6 ft. 3 in. engines of class S, of which 10 were in use prior to 1905, but of which a further 20 appeared early in the period under review, and yet another 20, with greatly enlarged boilers, in 1912. One of the latter engines, No. 825, is notable as being fitted with "Stumpf" cylinders. The Caledonian and Great Southern and Western Railways also built, in 1906, similar types of engines, the former with 5 ft. 9 in. wheels (a new superheater series has just been added), and the latter with 5 ft. 1¾ in. wheels, for mixed traffic service. The latest of these types is the Great Central "Glenalmond" class, identical in almost all details, except coupled wheels, which have a diameter of 5 ft. 7 in., with the large "Sir Sam Fay" type engines. Other companies, as the Great Eastern, Great Northern and Midland, have been content to build 0–6–0 type engines, in some cases with driving wheels of larger diameter than normal, in order to use at will on express goods or excursion passenger service. The



NORTH EASTERN RAILWAY: NO. 1352.
Designed by Mr. W. Worsdell.
Three-cylinder simple.

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logical expansion of the latter idea, in the most recent examples of this class of engine, has been the revival of the pony truck, and the old "Mogul," or 2–6–0 wheel arrangement, more particularly with a view to carrying the increased weight of the leading end of the engine owing to the use of a superheater, piston valves and an extended smokebox. Four such types have come into existence during 1913—the first on the Great Western Railway, the second on the Great Northern Railway, and the third on the London, Brighton and South Coast Railway, all with outside cylinders, while the fourth is a Scottish design, on the Caledonian Railway, and has inside cylinders. All these engines are superheater-fitted. As regards goods and mineral engines, but few changes have occurred. Eight-coupled tender engines were already in use on a large number of lines by the end of 1905, and during the eight years under review they have only appeared on one fresh line—the Hull and Barnsley. A number of companies, however, have modified existing 0–6–0 and 0–8–0 designs by the addition of superheaters, as the Great Western Railway, Great Eastern Railway, North Eastern Railway, Great Northern Railways of England and Ireland, Lancashire and Yorkshire Railway, Midland Railway, London and North Western Railway, and Great Central Railway, the engines in all these cases, although new, not embodying any radical departure from previous standards. In one or two cases, however, the addition of the superheating apparatus has entailed the provision of a pony truck to better distribute the weight; the latest Great Central Railway 8-coupled engines are thus entirely of the 2–8–0, or "Consolidation," type, while the Great Northern Railway has just introduced another series of enlarged 8-coupled locomotives having the same wheel arrangement.

Perhaps the greatest strides of all, however, have taken place in the matter of tank engine development, particularly in the case of tank engines intended for main line or long distance service. As regards passenger tank engines, the most popular of new types have been those of the 4–6–2 and 4–4–2 wheel arrangements, which give smooth running at high speeds, owing to the provision of a leading bogie, and also have ample bunker accommodation. Of the 4–6–2 engines, the most notable are probably the two built by the London, Brighton and South Coast Railway—*Abergavenny* and *Bessborough*—for express service on that line. Just about that period there was a veritable epidemic of 4–6–2 tank engine construction, new engines of this wheel arrangement appearing on the London and North Western, Great Central and North Eastern Railways, although the last-mentioned was intended for mineral service. It is noteworthy, also, that the London, Brighton and South Coast, London and North Western and Great Central engines are all superheater-fitted. The 4–4–2 type tank engine has also had equal popularity. In addition to 4–4–2 passenger tank engines already at work on several lines, the Great Western and London and North Western Companies introduced this wheel arrangement in 1906, the London, Brighton and South Coast Railway in 1908, the North Staffordshire Railway in 1911 and the North British Railway in 1912. Many other remarkable passenger tank engines have also appeared during this eight years, among the most noteworthy of which have undoubtedly been the huge 4–6–4 or "Baltic" type tank engines built for the London, Tilbury and Southend Railway just prior to its acquisition by the Midland Company in 1913. The North Eastern 4–4–4 3-cylinder superheated tank engines of 1913, as well as the Midland 0–6–4 tanks of 1907, are also notable designs, while among others that might be mentioned are the Great Western 2–6–2 type tank engines, of two distinct classes, introduced in 1907, the Great Northern suburban tank engines of the same year having the 0–6–2 wheel arrangement, and the North Eastern 4–6–0 engines, built for the Whitby Coast Line in 1908.

Some equally remarkable tank engines have also been put into goods service. Prominent among these are the 3-cylinder 0–8–4 and 4–8–0 tanks used respectively by the Great Central and North Eastern Railways for banking purposes in gravity marshalling yards, to which reference has already been made. The large 3-cylinder 4–6–2 mineral tank engines employed by the North Eastern Railway have also been referred to previously; they are among the largest and heaviest machines in use in this country. Other noteworthy designs of the period have been the 0–8–2 banking engines of the Lancashire and Yorkshire Railway, built in 1909, the engines of the same wheel arrangement introduced by the London and North Western Railway in 1912, and the 2–8–0 tanks of the Great Western Railway, turned out in 1911 with a view to working the heavy coal traffic of South Wales.

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By Land or By Water.

RECENT OVER-SEA TRAFFIC DEVELOPMENTS BY BRITISH RAILWAYS.

By W. PARKER.

IT may be necessary to "go down to the sea in ships" to see the "wonders of the deep," but to acquire an adequate idea of the magnitude of the interests possessed by British railways in sea-borne trade, a visit to one of the many great railway ports to be found on our coasts is all that is needful.

In October, 1905, the present writer contributed a synopsis of dock and harbour developments by British railways. It is not here intended to recapitulate what was then recorded, but rather to provide particulars of developments that have since taken place, while also giving due consideration to important historical facts not previously presented.

Alexandra (Newport and South Wales) Docks and Railway.

Last year saw considerable progress made with the dock extension works at Newport (Mon.) The deep water area of the extended South Dock now amounts to 96 acres, which gives it the distinction of being the largest single dock in the United Kingdom. The new entrance lock, the largest of its kind in the world, has been practically completed and it is expected that the official opening will take place in July. To all intents and purposes the lock proper is finished and only the removal of the outer concrete dam and the construction of the timber jetties from the wing walls across the foreshore has prevented it being brought into use. At the south end of the lock, about mid-way between the middle and outer gates, is situated the dock pumping and electric lighting and power plant. The whole of the machinery has been installed and is now being tested, and, it is anticipated, will be brought into permanent use very shortly.

A further portion of the new south quay is about to be fitted with eight additional hydraulic luffing cranes: six of these will be compound, 30 cwt. and 3 ton; the seventh will be a triple-powered, 30 cwt., 3 ton and 6 ton, crane; and the eighth will also be triple-powered, 3 tons, 6 tons and 10 tons. For exporting coal, before long, three additional high bunkering hoists will be in course of erection west of the four already provided in the south dock extension. These should enable Newport to deal with at least another 1¼ million tons of coal each year. This increase in the number of cranes and hoists involves the provision of additional running roads and sidings, as well as the extension of the hydraulic power plant to meet the increased demand for pressure.

Reference must be made to the New Lock Entrance Channel, which is in course of construction between the New Lock entrance and the limits of the Harbour Commissioners' jurisdiction. The bottom width of the new channel, when formed, will be about 650 ft. at its narrowest part, widening to 1,000 ft. opposite the New Lock Entrance Piers and 800 ft. at the seaward end. Between the points named the length of the channel will be approximately two statute miles. The work is being carried on day and night. Approximately, the quantity of material to be removed is 1½ million hopper tons, and it is anticipated that the work will be completed by the time the new lock is ready for traffic.

Dredging at the outer end of the Channel, by the Alexandra Company's dredger *Bruce*, commenced on the 25th of July last, and the British Dredging Company, to whom a contract has been let to raise a minimum of 500,000 hopper tons, began dredging on the 15th of August on the inner portion of the channel. Both plants are working inwards. The channel will be continued for a short distance above the east pier of the new lock entrance for the purpose of facilitating the manœuvring of vessels entering and leaving the lock.

Under the able management of Mr. John Macaulay, Newport Docks and progress became synonymous, and the foregoing facts testify that the Macaulay tradition is being

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well maintained by his successor, Mr. J. H. Vickery, who took charge of the docks and railway just over twelve months ago.

Barry Railway.

Since October, 1905, the chief characteristic of the Barry Docks is the extraordinary activity developed thereat. Imports and exports during 1905 amounted to 9,070,864 tons. The figures for 1913 exceeded the enormous total of 11½ million tons!

On the dock side the sidings have been re-arranged and additional accommodation has been provided for the storage of coal and other traffic. Operating arrangements in connection with the transport of coal and other traffic have been centralised and are now under the supervision of a Train Control department. One additional coal tip has been erected, and five modern fixed and movable coal tipping appliances and three hydraulic cranes are in course of construction.

A considerable area of land has been added to the undertaking for dock extension and for the provision of sites for new works.

Large flour mills have been erected on the dock side and other minor alterations have been made by the Barry authorities.

Mr. T. H. Rendell succeeded Mr. E. Lake as general manager in 1908.

Caledonian Railway.

In connection with dock development the outstanding feature has been the completion in October, 1906, of the dock at Grangemouth—the Caledonian Railway's East Coast port for shipment of coal from the Lanarkshire coalfields—the largest railway-owned port, with the most up-to-date dock appliances, in Scotland. Extensive storage accommodation is provided, and splendid facilities for expeditious loading and discharge of traffic, the equipment including steam and hydraulic cranes, hoists, schutes and capstans of the most modern types. The hydraulic hoists are each capable of shipping 50 wagons per hour, and some of them, being movable, can be so placed as to permit of three hoists working simultaneously into a vessel if necessary. The weighing machines connected with the hoists can weigh traffic alongside on shipment, and show the gross tare and nett weight of each wagon when desired.

The sea-lock on the Firth of Forth, which is 626 feet long by 80 feet wide, gives direct and easy access to vessels of the largest size, drawing up to 26 feet of water. The docks are lighted throughout by electricity, and the many miles of dock lines and sidings are in direct rail communication with all parts of the United Kingdom.

To facilitate the working of the immense traffic into and out of the port it has been necessary to construct additional access to the docks, and in consequence the new Grahamston lines, nearly three miles in length, are now open for traffic. The new lines avoid the traffic passing through Grahamston station, a very busy place, used by both Caledonian and North British Railways. The lines extend from Sunnyside Junction between Camelon and Grahamston to Fouldubs, about a mile and a quarter south of Grangemouth station. Two lines of way have been laid, but the necessary land for four lines throughout has been acquired. The railway crosses the Forth and Clyde Canal (also the property of the Caledonian Company) near Dalderse by means of a swing bridge operated by hydraulic power.

To serve the new Rothesay dock recently constructed at Clydebank by the Clyde trustees, a new branch line from the Caledonian Company's Lanarkshire and Dumbartonshire Railway has been formed, and extensive siding accommodation has been provided at the dock.

There have been no important steamship developments in connection with the Caledonian Railway since 1905, but the Company's fleet of steam packets sailing from Gourock, Wemyss Bay and Ardrossan Piers to all parts of the Firth of Clyde has been augmented by the addition of the turbine screw steamer *Duchess of Argyll*, length 250 feet, breadth 30 feet, depth 10 feet 6 inches, 3,600 indicated horse power, speed 21¾ knots per hour, and passenger capacity 1,713.

Cardiff Railway.

To feed the Bute Docks was the sole *raison d'etre* for the construction of this railway. Its authorised mileage is about 24½ miles, while the dock lines, located within an area of one square mile, comprise a system of some 120 miles. On July 13th, 1907, the late King Edward visited the port and opened the Queen Alexandra Docks. At the beginning of 1910 Mr. Charles S. Denniss became general manager, and on March 1st, 1911, passenger traffic commenced on certain sections of the railway. Cardiff is the world's premier port for the export of coal and most people are aware of the fact, but it is not generally known that the Welsh capital is the first port in the United Kingdom for the importation of potatoes.

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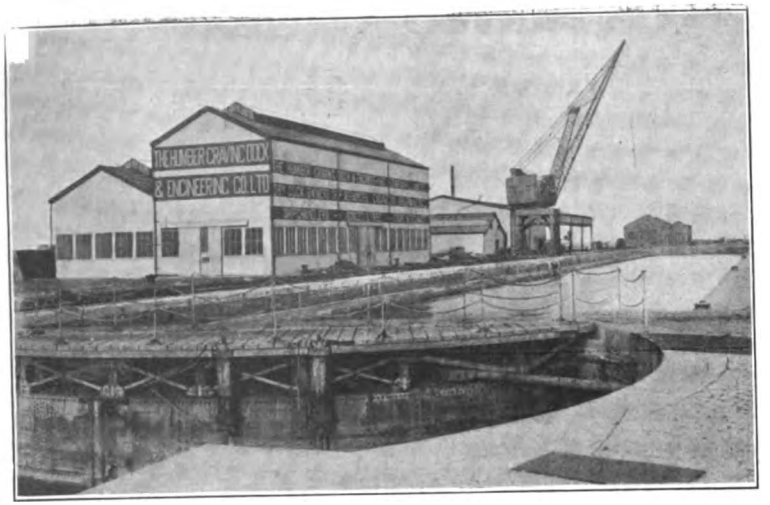
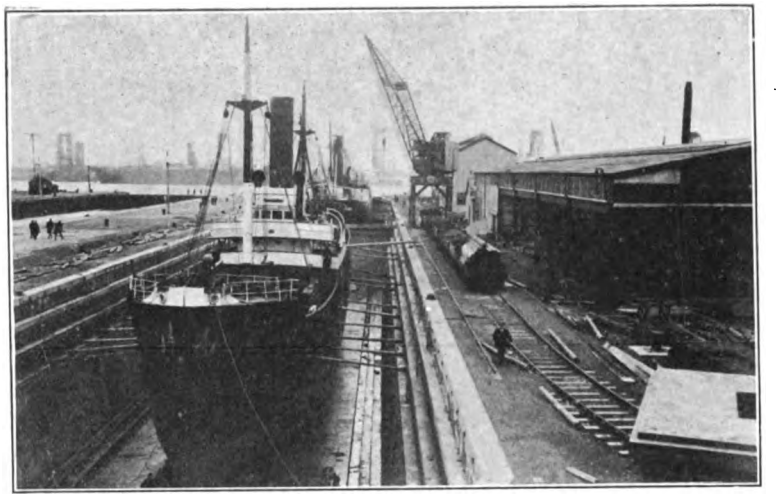
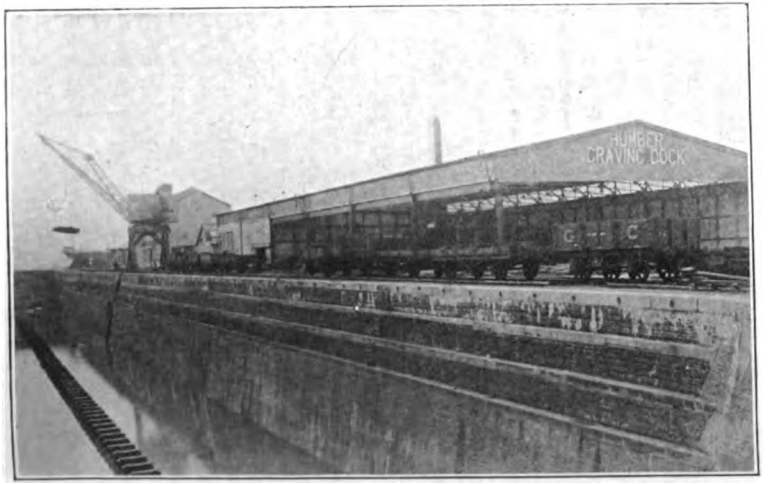


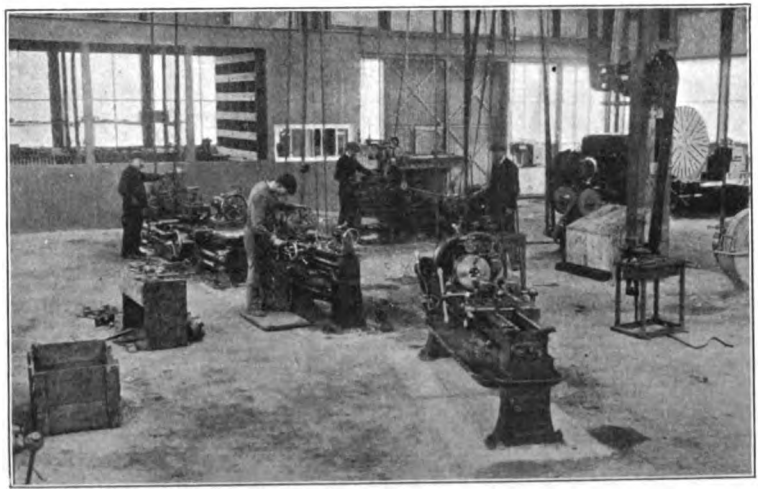
WORKSHOPS, TRAVELLING JIB CRANE, AND PUMP HOUSE.



WORKSHOPS AND SS. *Broomfield* AND *Riding* IN DRY DOCK FOR REPAIRS.



VIEW OF WORKS FROM THE UPPER END OF DRY DOCK.



MACHINE SHOP WITH LATHES, SCREWING AND SHAPING MACHINES, ETC.

HUMBER GRAVING DOCK, IMMINGHAM. GREAT CENTRAL RAILWAY.

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Great Central Railway.

Unquestionably the most important event in British railway history of recent years was the formal opening, by their Majesties the King and Queen on 22nd July, 1912, of the magnificent King's Dock at Immingham, when the Great Central's General Manager, Sir Sam Fay, received his knighthood, a dramatic incident the writer was privileged to witness.

The dock was partially opened for traffic on 15th May, 1912, and the succeeding June issue of the Railway Magazine was made a special Great Central Railway number in honour of the occasion. The very complete description of the dock then given renders superfluous a lengthy list of dimensions and so forth here. Suffice it to say that the total water area of the dock, including the timber pond, is 45 acres, and the dock estate comprises 1,000 acres, with a river frontage of approximately 1½ miles, a total length of nearly 2½ miles, and about 1 mile in breadth. A magnificent graving dock has been provided, and in all some 172 miles of running lines and sidings have been laid down.

Immingham, coupled with the extension of its steamer services and additions to its fleet, has placed the Great Central in the front rank of British railways possessing blue-water interests. As the owners of the docks at Great Grimsby, the greatest fishing port in the world, the Great Central already had a valuable sea-borne trade, but by the opening of the new dock at Immingham, which is, in addition to its other qualifications, the finest coal shipping port in the North of England, scientifically laid out on modern principles, with gravity sidings providing rapid and economical working, the over-sea traffic of the line, it is not surprising to find, is growing by leaps and bounds.

Into Immingham regularly for general cargo come the P. and O. steamers, while Messrs. Thomas Wilson, Sons, and Co. Ltd., and the Hamburg-America Line, have arranged regular sailings to India and South America respectively. Several large lines send their steamers to Immingham to bunker. As a general port for the Baltic, Northern and Central Europe, Immingham has a big future before it, while for the shipment of coal 2½ million tons per annum is considered a modest estimate of the traffic that will soon be in progress.

Great Eastern Railway.

A number of minor ports on the East Anglian coast are served by the Great Eastern Railway, and the sea-going services of this railway's own Continental department between Harwich and the Continent are well appreciated by the travelling public and the consignors of goods. There has been no development of great importance in the working during recent years, but it may be mentioned that all the steamers on the Hook of Holland and Antwerp services are now fitted with wireless telegraphy and submarine signalling.

Furness Railway.

After a lapse of eight years, it would hardly appear to the casual observer that any very marked alteration has taken place in the development of the railway-owned harbour and docks at Barrow-in-Furness, but five minutes' chat with Mr. Alfred Aslett, the genial general manager, will convince him that outward appearances are not to be relied on, for large sums of money have been expended in improving the fairway through the docks, and providing deep water berths to cope with the ever-increasing size of warships built at Barrow by the world famous firm of Vickers, Ltd., and the better accommodation of merchantmen trading to the port.

In the years 1905–1906 a deep water berth, with a minimum depth of 30 ft., was constructed by taking off a slice of land at the south-west corner of the Buccleuch Dock, and a large 150 ton electric crane erected on the quay for the purpose of fitting out battleships and cruisers. This improvement was, of course, not of much avail unless the means of access were increased proportionately, and in 1907 the work of widening the Buccleuch Dock bridge from 80 to 100 feet was commenced to enable large warships to proceed to the berth, where they would be fitted out before taking up their station. October, 1908, saw the completion of this immense undertaking by the erection of a Scherzer bascule bridge across the passageway, at a cost of £80,000. The work of altering and widening the passage-way was under the charge of Messrs. Baker and Hurtzig and the late Mr. Frank Stileman. The Scherzer bridge replaced a swing bridge. In length the movable span, centre to centre of bearings, is 108 feet, and the clear width of navigable channel is 100 feet.

The powerful twin screw tug *Cartmel*, 1,300 I.H.P., was added to the Furness Railway fleet in the year 1907, to assist large vessels using the docks and harbour,

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and a steam barge, capable of carrying 540 tons of dredged material, was constructed in the same year to augment the extensive dredging plant which is continually working in or near the port.

In 1905 the building of a massive bridge spanning Walney Channel was commenced, and as it was not completed until 1908 some idea of its magnitude may be conjectured. Situated about 400 yards south of Devonshire Docks, it has an opening span of 120 feet.

A large aerodrome was erected at Cavendish Dock in 1910 for the construction of airships by Vickers Ltd.

During 1911 and 1912 the extra services of three large dredging companies were requisitioned and an enormous amount of dredging was completed in Walney Channel and on Piel Bar, vastly improving the approach to the docks. A deep water berth was also completed in Walney Channel, between the Fleetwood Passenger Pier and the Harbour Yard Pier. This berth, 850 feet long and 100 feet wide, with a depth of water at L. W. O. S. of 33 feet, will prove very advantageous in case of emergency. To avoid lightening large steamers carrying grain, the berth at Devonshire Dock grain warehouse has been deepened, enabling vessels to discharge cargoes direct into the warehouse and silos of Messrs. Walmsley and Smith, thus saving time and expense to the shipowner.

Owing to the heavy shipments of imported petroleum it has been necessary to increase the accommodation for storing oil in bulk, and tanks with a capacity of 34,520 tons are now in use, as compared with a storage capacity of 22,500 tons in 1905. Provision has also been made for the accommodation of Asiatic crews compelled to live ashore whilst steamers are discharging cargo.

A steadily increasing passenger traffic on the Furness Railway steamers plying between Barrow and Fleetwood was met by purchasing the P.S. *Gwalia* (afterwards named the *Lady Moyra*) from the Barry Railway in 1910. This well equipped vessel has accommodation for 1,015 passengers on a No. 3 certificate, and is capable of making the journey between Barrow and Fleetwood

THE SCHERZER BRIDGE, BARROW DOCKS: FURNESS RAILWAY.

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under the hour. The popular steamer *Lady Evelyn* carries 714 passengers on a No. 3 certificate. Passengers conveyed by these steamers for the 1913 season numbered no fewer than 178,830, being an increase of 42,229 over the season of 1912.

Great Western Railway.

Long before the railway era the possibilities of Fishguard as a port were freely admitted by the Lords of the Admiralty, and Brunel, in planning the route for what is now the South Wales section of the Great Western Railway, recognised the advantages of Fishguard Bay, and chose it as the point for the western terminus of the line.

It was not, however, until August 30th, 1906, that the Fishguard route to Ireland became operative. The distance between Fishguard and Rosslare is only 54 nautical miles. The inauguration of the route included the provision of three magnificent turbine steamers and new harbour stations at Rosslare on the Irish side and Fishguard on the Welsh side.

In 1907 the Great Western opened a new landing pier at Plymouth for dealing with increased ocean traffic and likewise inaugurated a service between Plymouth and Brest. For the Fishguard-Rosslare service a new turbine steamer, *St. Andrew*, was provided in 1908. In the same year the first ocean liner, the Booth s.s. *Lanfranc*, called at Fishguard to discharge passengers and mails; a new ferry steamer, *The Mew*, was provided to replace *The Dolphin* on the Kingswear-Dartmouth Ferry, and two new tenders for the Plymouth Ocean passenger service, *Sir Francis Drake* and *Sir Walter Raleigh*, were provided.

During 1909 a service between Weymouth and Nantes was inaugurated by s.s. *Melmore*, and new pumping machinery installed in the graving dock at Plymouth, but the great event of the year that appealed with most force to the public's imagination was the first Cunarder call at Fishguard to discharge passengers and mails.

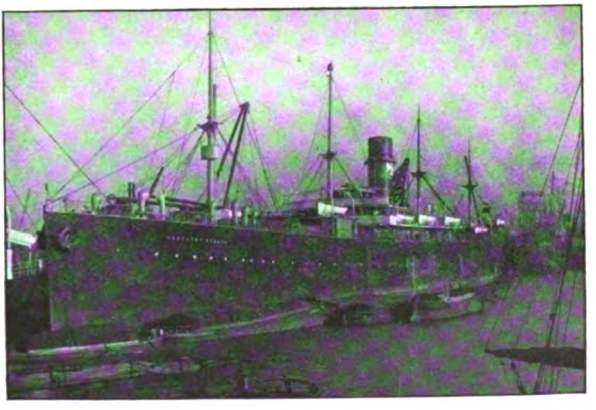
In 1910 the Great Western purchased the s.s. *Bretonne* and *Atalanta*. The same year saw the first Blue Funnel Line steamer leave Fishguard for Australia and the Nantes sailings were transferred from Weymouth to Plymouth. In September, 1911, this service, as well as that between Plymouth and Brest, was brought to a termination. In 1912 hydraulic cranes were installed at Plymouth Docks and the new steamer *Waterford* was provided for the Fishguard-Waterford service.

Hull and Barnsley Railway.

When the writer dealt, in the 100th number with the important part played by this Company in the commercial prosperity of the port of Hull he instanced the value of the Alexandra Docks in the promotion and maintenance of such prosperity, and prophesied still further progress. This prophesy has been fulfilled, for whilst in 1904 the tonnage of vessels entering the Alexandra Docks was 1,581,576, in 1913 the figures were 2,827,552, and the annual coal shipments have risen from 1½ million tons to 3,300,000 tons.

The axiom that trade follows facilities is thereby exemplified, for the Company in 1911 opened their river pier, which is situated upon the Humber, and runs from the Alexandra Docks' entrance for a distance of 1,300 feet, its width varying from 52 feet to 125 feet. This pier is equipped with two electric belt conveyors for the rapid shipment of coal, each with a potential shipping capacity of 600 tons per hour, and having special devices not only to reduce breakage of the coal but to miminise the need for trimming. These conveyors form a valuable adjunct to the seven modern hydraulic coal hoists in the Alexandra Docks.

The pier possesses a warehouse (with an interior overhead electric travelling crane), railway lines connected with the Company's system, electric cranes and capstans, and is fitted to deal with fruit, perishables and



AN AUSTRALIAN LINER IN THE ALEXANDRA DOCK, HULL.

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general merchandise, whilst passengers may also be accommodated.

Well equipped for the conduct of a general inward and outward trade, the Alexandra Docks regularly accommodate vessels bringing in cargoes of timber, grain, seed, wool, provisions, frozen meat, fruit, etc., the outward cargoes consisting principally of coal, earthenware, bale goods (cottons, linens, woollens, worsteds, etc.), machinery, engines, and machines (agricultural and otherwise), leather, oil, paints, colours, chemicals, iron and steel, manures, etc. There are numerous electric, hydraulic and steam cranes, commodious warehouses, sheds, cellars, cold stores, storage grounds for timber, etc., all conveniently placed and contiguous to the steamers' berths.

Steamers having fixed services with America (North and South), Australia, Black Sea, Canada, China, Egypt, India, Japan, North Pacific Ports, Portugal, Straits Settlements, Turkey, etc., regularly berth at the Alexandra Docks.

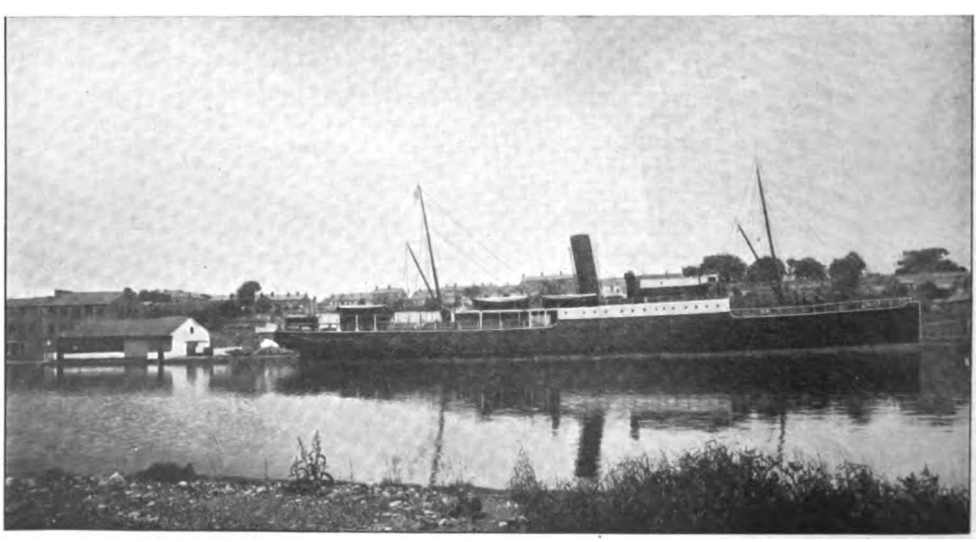
The Hull and Barnsley Railway, jointly with the North Eastern, are constructing a new dock at Hull (the Joint Dock), which, it is expected, will be opened during 1914. This dock is situated to the east of, and is nearer to the sea than, the Alexandra Docks. It will primarily have a water space of 53 acres, to be extended to 85 acres, and it will be furnished with a grain silo with a storage capacity of 40,000 tons, six coaling berths with electric appliances, two commodious dry docks, extensive warehouse accommodation, electric cranes, etc., in fact, all the latest devices of science will be brought to bear upon its equipment.

Together with the North Eastern, the Hull and Barnsley are likewise erecting an oil jetty, extending for a distance of 1,500 feet into the Humber, further to the east than the Joint Dock, where large vessels can, at any state of the tide, discharge cargoes of petroleum, petrol, motor spirit, and so forth. About 120 acres of land will be available for storage, having river, rail and road connections and an installation of the latest facilities for dealing with oil.

Lancashire and Yorkshire Railway.

The Lancashire and Yorkshire Company are concerned in the largest fleet of railway-owned vessels in the British Isles. These steamers annually run about 850,000 nautical miles, equal to a single journey between Queenstown and New York every week-day throughout the year. The services comprise Goole and Continental ports (9), Liverpool and Drogheda, Fleetwood and Belfast.

On January 1st, 1905, the Lancashire and Yorkshire Railway, under powers obtained in 1904, commenced to run steamers between Goole and various Belgian, Dutch and Danish ports, taking over the steamers owned by the Goole Steamship Company and later the vessels of the Co-operative Wholesale Society. New steamers have been added, and to-day the fleet numbers 23 vessels, with two new



LANCASHIRE AND YORKSHIRE RAILWAY'S TWIN-SCREW STEAMSHIP *Colleen Bawn*, LIVERPOOL AND DROGHEDA SERVICE, ALONGSIDE QUAY AT DROGHEDA.

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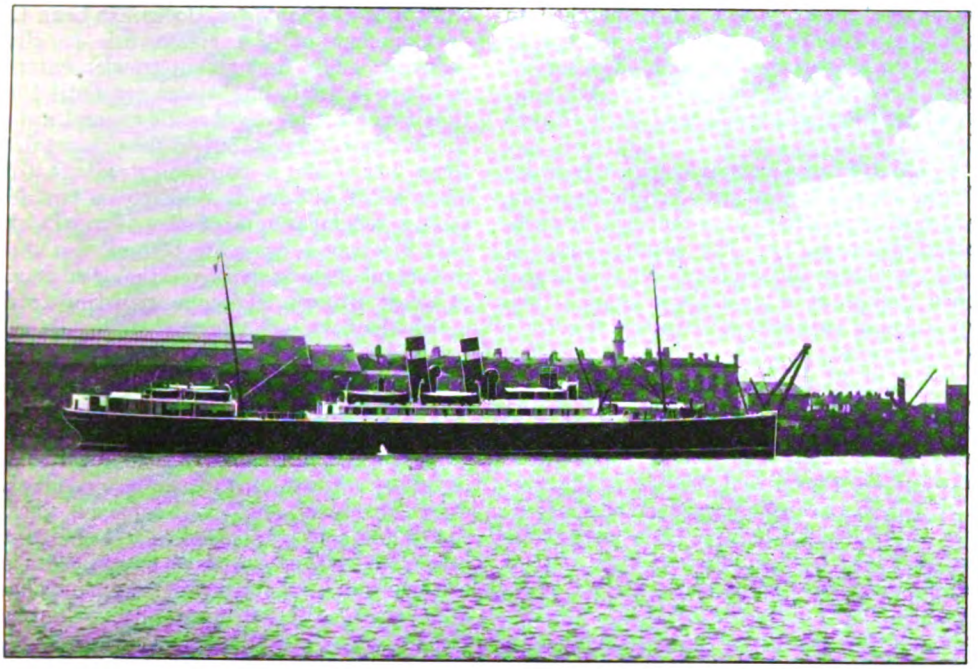

TURBINE STEAMSHIP *Duke of Cumberland*, ROYAL MAIL SERVICE, FLEETWOOD AND BELFAST, AT FLEETWOOD.

steamers in the hands of the builders. These vessels, used principally for the conveyance of merchandise, are of the single screw type, and have good accommodation for about twelve passengers. Calls are made at Hull during the summer with fruit and perishables from the Continent.

Goole has the advantage of being the most inland port on the East Coast, and is within easy reach of the industrial districts of Yorkshire and Lancashire. First comes coal from the south and west Yorkshire Coalfields, then manufactured goods from Lancashire and Yorkshire, and machinery. One feature in connection with the import traffic is worthy of special mention, and that is the butter shipped from Copenhagen. Cargoes reach Goole each Sunday, and are unloaded and despatched to Manchester (75 miles) at 4 a.m. on Monday, reaching that city at 9 a.m., and the butter is delivered to the merchants immediately on arrival.

At Goole the railway wagons run alongside the steamers, and the development of the port is due largely to the enterprise of the Lancashire and Yorkshire Railway. The Docks, owned by the Aire and Calder Navigation Company, extend over a large area, and there is an excellent passage way to the sea by the River Ouse.

Special arrangements have been made for dealing with the constantly growing coal traffic which passes through Goole. There are five up-to-date coaling appliances provided, enabling loaded wagons up to 20 tons to be dealt with, and the rate of tipping compares most favourably with that at other ports in the United Kingdom. Hydraulic cranes of 50 and 25 tons lifting capacity are available for the transference of machinery and other exceptionally heavy traffic from the railway trucks to the steamers and vice versa.

The steamers engaged on the Liverpool and Drogheda service, which is maintained regularly throughout the year, are twin-screw and bear the names of the *Mellifont* and *Colleen Bawn*. They are 260 feet in length, with a breadth of 35·5 feet, and have a gross tonnage of 1,204, horse power 3,812, and speed 17·8 knots. At Liverpool they are berthed in the Collingwood Dock, adjacent to the Lancashire and Yorkshire Railway's North Docks goods and cattle stations, where every accommodation is at hand for the expeditious transfer of traffic. At Drogheda the steamers berth at the Riverside Quay, a short distance from the Great Northern Railway station, and every facility is afforded for the loading of fat and store

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cattle and sheep, which are dispatched in large quantities to Liverpool for conveyance by rail to all parts of England. The service from Liverpool to Drogheda is the most direct for the charming district of the Boyne Valley.

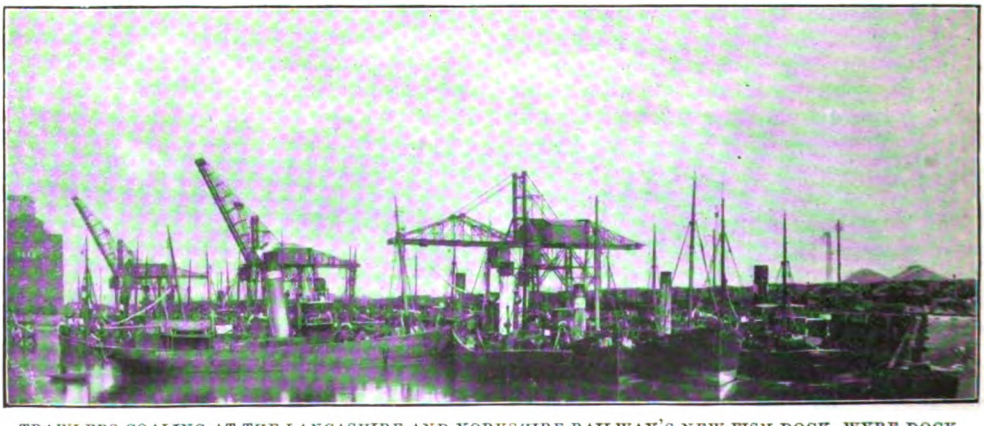
Up to 1891 the vessels engaged between Fleetwood and Belfast were paddle steamers, but in that year they were replaced by twin-screw steamers, and the results obtained were eminently satisfactory. In 1909 a still more important advance was made; two fine turbine twin-screw steamers, the *Duke of Cumberland* and *Duke of Argyll*, possessing a speed of 21 knots, were placed on the service. They are among the best fitted ships afloat and are well able to maintain the proud claim that the Royal Mail Route between Fleetwood and Belfast is the premier route between England and the Emerald Isle. In addition, there are three twin-screw steamers, the *Duke of Albany*, *Duke of Connaught* and *Duke of Cornwall*.

Among many indications of the progressive policy of the Lancashire and Yorkshire Railway in relation to the active industrial centres through which its system passes, mention must be made of the development of Wyre Docks, which are adjacent to the port of Fleetwood on the Wyre Estuary in Morecambe Bay. Whilst Fleetwood has from year to year been advancing in importance as the English base of a fast and luxurious cross-Channel service with Ireland, it is the steady growth of the Wyre Docks (which are owned by the Company) that has brought the name of the port so prominently before the minds of shipowners and charterers generally.

Perhaps the most remarkably successful enterprise at the Wyre Docks has been the development of the steam fish trawling industry. The first steam trawler entered the port in 1891, but it was not until 1906 that this class of vessel made general use of the harbour. From 1897 to the present date there has been a continuous satisfactory increase. There are over 120 steam trawlers sailing regularly out of the Wyre Docks, and Fleetwood has now become the most important fishing port on the west coast of Great Britain. To cope with this traffic a fish dock was constructed, and this was brought into use in 1908. The basin has an area of 15 acres, and the total length of slades available for dealing with the fish traffic is 2,000 feet. When trawlers berth alongside the slades, their catches are lifted by means of the ship's own tackle direct on to the slades, where the fish is sorted and sold by auction. These slades are attended by representative buyers from all the markets of the Kingdom, who purchase and re-pack the fish according to instructions.

Special train services (both goods and passenger) are in operation daily for the conveyance of fish to all parts of the United Kingdom. There are three electric cantilever cranes at the new fish dock, each capable of coaling two trawlers lying abreast at the rate of 50 tons per hour.

To meet the growing demand of the trade a huge ice factory has been built on the dock estate, equipped for a daily output of 160 tons, storage also being found for about 1,000 tons of ice. Crushed ice for packing is delivered at various points along the slades from conveyers—a method calculated to keep the ice clean, and to reduce waste,



TRAWLERS COALING AT THE LANCASHIRE AND YORKSHIRE RAILWAY'S NEW FISH DOCK, WYRE DOCK, FLEETWOOD.

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while securing the maximum of expedition. Water is delivered on board all vessels direct from hydrants fixed along the different quays, obviating the necessity for "tank" boats, which have to be employed at so many ports in this country.

London and North Western Railway.

As a dock and harbour owner, the premier line is principally known to the man in the street by reason of the possession of Holyhead Harbour. Garston Docks, on the Mersey, near Liverpool, form a typical railway port much favoured in commercial circles and Fleetwood is jointly owned with the Lancashire and Yorkshire Railway.

There is no great development within recent years to record. A high state of efficiency was acquired many years ago and has been consistently maintained by the introduction of new machinery and equipment as need has arisen. The fine new turbine steamer *Greenore*, engaged in the Holyhead-Greenore service, was illustrated and fully described in the Railway Magazine, October, 1912.

Likewise the train services have been accelerated and the boats improved and equipped with wireless telegraphy. A recent innovation has been the installation of a submarine bell signal outside Holyhead. All the steamers in the London and North Western service have been fitted with submarine receiving apparatus enabling ships to locate their position in foggy weather.

London and South Western Railway.

Southampton Docks are well-known throughout the commercial world. Their rise from obscurity to national importance after becoming railway property is a story that does not come within the scope of the present article.

On October 21st, 1905—the centenary of Nelson's memorable victory—Trafalgar dry dock was opened. It was constructed large enough to accommodate any vessel then afloat, but, so rapid was the development of the tonnage of the world's great liners, within three years it became necessary to enlarge the dock.

With characteristic enterprise the directors faced the situation, and after two years' complex engineering work the enlarged dock was ready for use, the dimensions being :— Length, 897 ft. ; width at entrance, 100 ft. ; width inside lowest altar, 102 ft. ; depth over cill at H. W. S. T., 35 ft. ; depth over blocks, 33 ft. If necessary, the blocks can be lowered to take a vessel of deeper draught, and Southampton can boast the possession of a dry dock large enough to accommodate the largest liners in the world.

The American Line steamship *St. Louis* entered the dock on April 4th last, being the first vessel to take advantage of these greatly improved repairing facilities.

In October, 1907, the contract for the construction of a new 16 acre deep water dock was let. The creation of this mammoth dock enabled Southampton to become the home port of the magnificent White Star triple-screw liner *Olympic*, which entered on her maiden voyage from Southampton to New York on June 14th, 1911. So great are the dimensions of this huge vessel of 45,000 tons (gross), the writer, who was privileged to inspect her during the preparations for the voyage, was struck by the fact that she taxed to the utmost the resources of the enormous dock accommodation provided.

To its fine fleet of Channel steamers in 1912 the London and South Western Railway added two new turbines, named *Normannia* and *Hantonia*, to serve with the turbine *Sarnia*, a remarkably fine vessel placed on the Southampton-Havre route to the Continent in 1911. This route for Normandy, Rouen, Paris and beyond is deservedly popular among the many who enjoy a sea voyage as part of a vacation tour. A characteristic article from the pen of Mr. W. T. Perkins, descriptive of the Southampton-Havre services, appeared, profusely illustrated, in the Railway Magazine, June, 1913, and attracted much attention on both sides of the English Channel, but particularly among the British colony in Paris.

London, Brighton and South Coast Railway.

Continental traffic forms a considerable portion of the business of this line, and the sea services are maintained in a high state of efficiency. The ports of Newhaven and Dieppe have been placed in wireless telegraphic communication, while last year saw the introduction of the magnificent turbine *Paris*, which, like the other turbine and twin-screw steamers employed between Newhaven and Dieppe, is the joint property of the London, Brighton and South Coast and French State Railways.

North British Railway.

The North British Railway is the largest dock owner in Scotland, possessing extensive

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docks at Bo'ness, Methil, Alloa, Silloth, and Burntisland. At Methil, on the northern shores of the Firth of Forth, the traffic having outgrown the accommodation, Parliamentary powers were in 1907 obtained for the construction of a new dock, 16¼ acres, immediately east of the old docks. The new dock's entrance has been designed for the accommodation of the large steamships now occupied in the Continental and Mediterranean coal export trade. When completed the new dock will be equipped with the most modern appliances, and it is calculated the loading capacity of the port will be between 150,000 and 200,000 tons per diem.

NORTH EASTERN RAILWAY.

To the interests shared in the port of Hull by the North Eastern with the Hull and Barnsley and the Lancashire and Yorkshire Railways respectively reference has been made, but the great railway company that serves so admirably the north-eastern counties of England has enormous concern in the affairs of the premier Humber port quite independently of any other lines.

In passing, a few facts and figures on the value of the general trade of the port of Hull will not be out of place. The money value of the imports, exports and transhipment in 1905 was £53,548,572 and in 1912 £80,346,407. Coal exported in 1905 amounted to 3,171,316 tons and in 1912 reached the enormous total of 6,026.645 tons. These figures were exceeded during 1913 when the total shipments of coal and coke at Hull amounted to 6,840,918 tons.

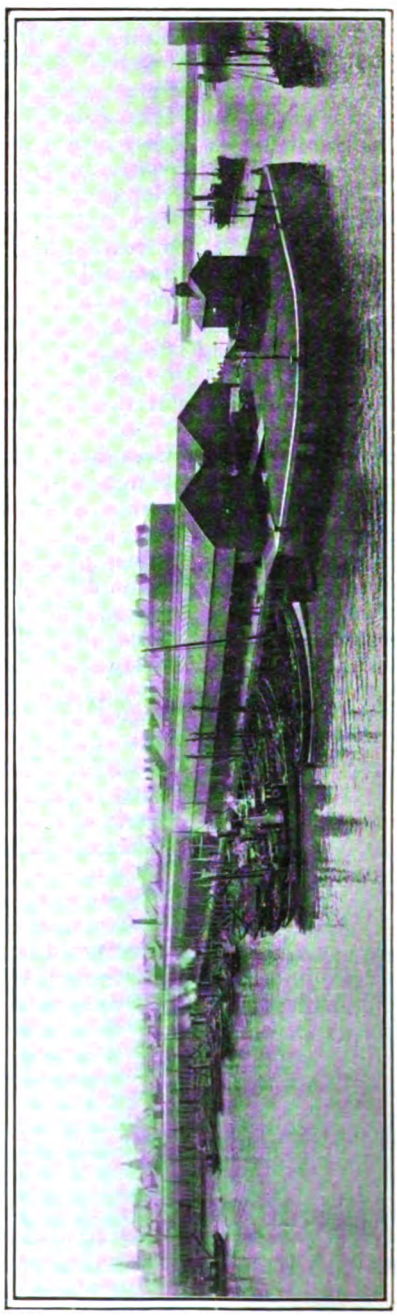
A riverside quay was built by the North Eastern Railway in 1908, primarily for berthing vessels engaged in the near Continental trades. In length 2,500 feet and from 85 to 150 feet wide, the quay is covered throughout, and equipped with 10 electric cranes. Alongside there is a depth of 16 feet of water at L.W.O.S.T., enabling vessels engaged in these trades to come alongside at any state of the tide and discharge their fruit and other perishable cargoes, sales of which are held daily during the summer months. Railway lines are laid the whole length of the quay, goods being transferred between ship and truck entirely under cover.

A fully equipped passenger station is also provided, special boat trains running in connection with the following services of steamers :—

Rotterdam (every week-day), Gothenburg (weekly), Bergen (weekly), Christiania (weekly), Zeebrugge (tri-weekly during summer).

Owing to the special facilities provided, steamers can arrive and depart at fixed times, and passengers can pass between train and ship under cover.

In 1910, two electric coaling belts were installed at Victoria Dock, these being the first appliances of the kind in the British Isles. Each belt has a shipping capacity of 600 tons per hour.



[*Photochrom Co., Ltd.*

NORTH EASTERN RAILWAY FISH QUAY, WEST HARTLEPOOL.

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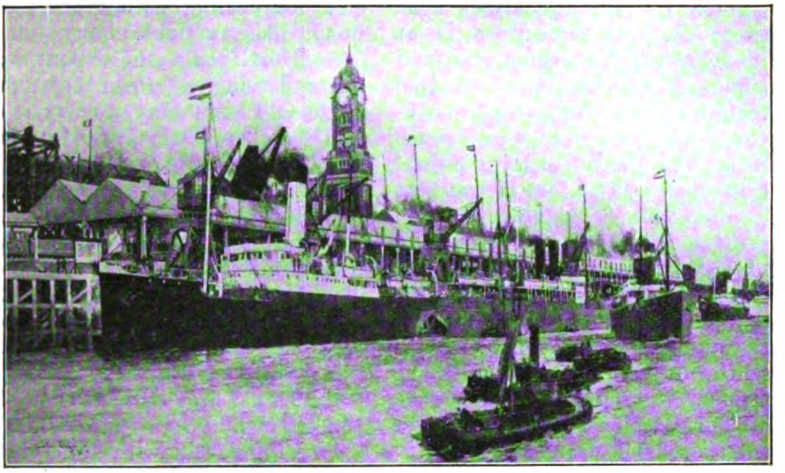
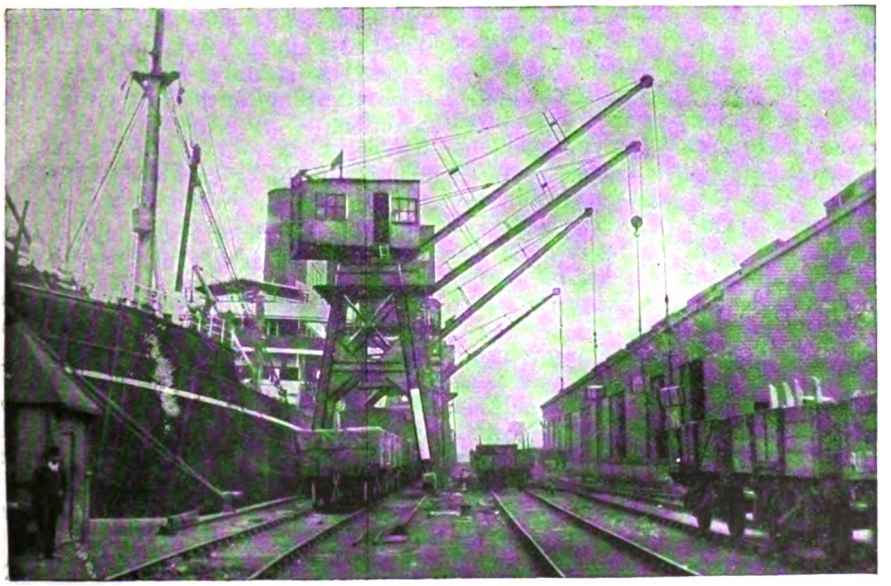


RIVERSIDE PIER, HULL : NORTH EASTERN RAILWAY.

Photo] [*Photochrom Co., Ltd.*

TYNE DOCKS : NORTH EASTERN RAILWAY.



SHIPPING FINE GOODS, NEW TRANSIT SHED, MIDDLESBROUGH DOCK :
NORTH EASTERN RAILWAY.

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Further north on the "coaly" Tyne North Eastern Railway enterprise is at work. To develop the Norwegian mail and tourist traffic and provide increased coal shipping facilities, the Company is constructing a riverside quay near the entrance to Tyne Dock. The quay will have a total length of 1,865 feet, and 25 feet of water at L.W.O.S.T. alongside. Equipment will include an up-to-date passenger station, a transit shed, six cranes for handling general goods and two coal hoists. Hoists capable of shipping at heights of 65 and 60 feet respectively at H.W.O.S.T. will enable light vessels to take coal at any state of the tide. Considerable improvements to the entrances to Tyne Dock, providing a greater depth of water, are to be carried out.

Tyne Dock coal shipments now reach over 7,000,000 tons per annum, and since its opening in 1859 the huge total of 260,000,000 tons has been shipped.

At West Dunston coal shipping staiths having three loading berths are being erected by the North Eastern Railway. These staiths are similar to those the railway owns at Dunston, where there are six berths, each equipped with two spouts capable of teeming into two hatchways at once at 44 feet above H.W.O.S.T. From these staiths 3,000,000 tons of coal are shipped annually.

Middlesbrough Dock (River Tees) is the principal dock on the East Coast for liners engaged in the Far East and other overseas trades. During the last two years the equipment has been completely modernised. It includes 41 quick-acting electric cranes of varying capacities up to 10 tons, and one 30 tons hydraulic crane; also two coal hoists, one of which has only recently been fitted with an auxiliary electric belt conveyor, and is capable of shipping 570 tons per hour. A similar conveyor has been erected in the entrance channel for the convenience of bunkering vessels not wishing to enter the dock. In addition, a transit shed for storing fine goods and general merchandise awaiting shipment has been erected.

In spite of extensions and improvements of the Middlesbrough Dock, the increasing trade of the Tees has necessitated an addition on a larger scale to the shipping facilities on the river. Therefore the North Eastern Company are promoting a bill in the ensuing session of Parliament to obtain powers to construct a River Wall and Quay on the south side of the Tees, between Grangetown and Redcar Jetty, a distance of about a mile. Fitted with suitable sheds, cranes, etc., for dealing with general cargoes, the quay will be available at any state of the tide.

At Hartlepools, the expansion of the industry having outgrown the accommodation at the Old Fish Quay, a new one was opened in December, 1910, 1,000 feet long and 80 feet wide, covered throughout, and with railway lines alongside, fish being landed, sold, and loaded to wagons under cover. Situated in Victoria Dock, which has a tidal entrance 200 feet wide, vessels arrive and depart without restriction as to tides. Coal, ice and stores are obtainable without leaving the dock, which is 17 acres in extent.

Landings of fish:—

1905.	1913 (to end of October).
112,240 cwts.	256,320 cwts.

Simultaneously with the construction of the Fish Quay at Hartlepools, new coaling staiths were constructed, separating the Victoria Dock from the Old Harbour. These staiths are equipped with eight electric belt conveyors, each having a working speed of 700 tons per hour, and are available at all states of the tide.

Coal shipments from the Hartlepools reach 2,000,000 tons per annum, and the following figures indicate the steady progress which the port has made:—

1905.	1912.
1,564,487 tons ..	2,092,250 tons.

Two additional anti-coal-breakers have been provided at Blyth, one at the Company's North and one at the South staiths. In all, there are now four of these appliances at Blyth. Nearly 5,000,000 tons of coal are shipped annually from these staiths. To meet the steadily increasing shipments, new staiths at North Blyth are in course of erection.

Portpatrick and Wigtownshire Joint Railways.

(Stranraer Railway Pier and Larne and Stranraer Steamer Service).

A new turbine steamer, the *Princess Victoria*, built by Denny, of Dumbarton, was added to the fleet in 1912 to replace a paddle boat of the same name, passed to the ship-breakers in 1910. The new turbine is a sister ship to the *Princess Maud* (1904) and is one of the best vessels engaged in the Irish service.

A considerable amount of dredging had to be undertaken at Stranraer Pier in 1910 to give sufficient quayage accommodation at low water for the bigger boats of which the fleet is now composed.

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The "long line" fishing industry at Stranraer dates only from January, 1907, and the season is usually December till March. In 1907 four steam drifters and two sailing craft visited Stranraer. In later years there have been from 15 to 20 drifters some seasons and the gross earnings of the most successful vessel has generally been about £700 for the three or four months. The fish include principally cod, ling, conger, skate and roker, but small quantities of hake, halibut, turbot, etc., are also landed.

Many years ago a successful herring fishing was prosecuted in Loch Ryan and its neighbourhood during the spring. After a prolonged absence from local waters the herring made a re-appearance in 1909, and each year since then the fishery has been carried on with great success. Over 100 boats are now engaged in this business during the spring months each year.

The tonnage of fish traffic despatched from Stranraer Harbour station is as under :—

1909	.. ..	218 tons.
1910	.. ..	599 ,,
1911	.. ..	810 ,,
1912	.. ..	1854 ,,
1913	.. ..	2032 ,,

On one day (January 23, 1912) about 550 tons were landed and despatched by railway in ten special fish trains.

During the spring season Stranraer Harbour also handles a considerable share of the herrings caught in Loch Swilly, in the north of Ireland. This traffic is conveyed by rail to Larne, thence to Stranraer by the Royal Mail steamer. In the busy season two fish trains are run each night to convey this important traffic to the English markets.

The short sea passage from Stranraer to Larne has found favour with motorists, and the officials at the two ports have earned a high reputation for their careful handling of cars. To show the increasing popularity of the route a few figures are given.

Year.	No. of Motor Cars carried.
1904	16
1906	131
1908	158
1910	237
1912	389

Since the establishment of a sea service between Stranraer and Ireland, much of the revenue has been derived from cattle traffic. The outbreak of disease in Ireland in June, 1912, put an end to this business for a time, but with the relaxation of the restrictions by the Board of Agriculture it was open to the management to recover the traffic by constructing a lairage and having the port authorised as a landing place for Irish live-stock. Lairage having accommodation for over 300 cattle was therefore opened on Sept. 26, 1913, and since the opening over 5,000 animals have been passed through to various markets in the South or Scotland and North of England.

SOUTH EASTERN AND CHATHAM RAILWAY.

During the period under review there have been no developments in the harbours owned by this railway and used for its Continental services, but a new station at Dover has been commenced.

To the fine fleet of cross-channel vessels have been added s.s. *Victoria*, *Empress*, *Riviera*, and *Engadine*. The whole passenger fleet now consists of turbines only and of the highest class.

In 1911 a new steamship service was commenced between Folkestone and Flushing, consisting of vessels belonging to the Zeeland Company, the owners of the boats on the Queenborough-Flushing route. Trains between London and Queenborough cross the Swale bridge connecting the mainland with the Isle of Sheppey, on which stands Queenborough. This, the first Scherzer type bridge erected in Great Britain, was completed in November, 1904.

Steamers belonging to the Belgian Government are employed between Dover and Ostend, and the fleet includes two new turbines, placed in service last year. These fine vessels are fitted with Frahm anti-rolling tanks, which give to passengers conditions of comfort never before attained in the channel services.

TAFF VALE RAILWAY.

Developments at Penarth Dock since 1905 may be put under three heads: (1) The erection of two additional movable tips, (2) the addition of a 50 ton movable steam crane and (3) the construction of a new pontoon and works.

Under the able management of Mr. Ammon Beasley, Penarth Docks are worked in a most efficient manner and have arrived at a high state of prosperity.

Rapid dispatch is a great feature of the port. A steamer has arrived at Penarth Dock and proceeded direct to the tips, and commenced loading at 11.55 a.m. The full cargo of 2,115 tons of coal has been completed by 1.50 p.m., and the vessel has sailed on the tide of arrival, having taken in the whole of the cargo in 1 hour 57 minutes.

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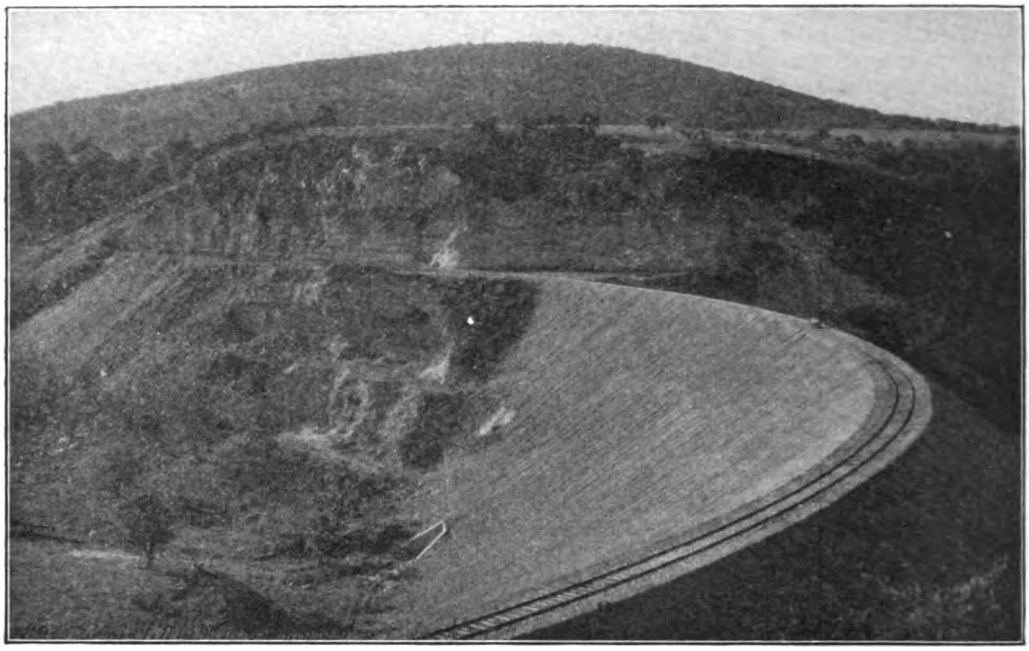

Photo] [*C. B. Waite, Mexico City.*

"THE BIG FILL": NATIONAL RAILWAYS OF MEXICO.

Passenger Travel in Mexico.

THERE is probably no country in the world enjoying lower passenger fares than Mexico, the first class rates averaging 2·4 cents (United States Currency) per mile; and second class half the first. The United States of America, which are usually credited with having the lowest fares, average a trifle over 2 cents (United States Currency) per passenger per mile. It will, therefore, be seen that Mexico's average rates are lower than those of the United States, while the accommodation provided for first class passengers is fully equal to that provided in the United States.

Approximately 75% of the passenger revenue of the Mexican railways comes from the second class. If there is one thing that the lower class Mexican loves more than another it is a ride in a train, and when he is fortunate enough to have a few dollars in hand he invariably spends it by taking himself and family for a railway journey. Frequently, his money will only be sufficient for the outward journey and he and his family must then tramp back to their homes.

Another way in which peasants and labourers spend much of their money is in religious pilgrimages. The National Railways handle every year, in particular, thousands of pilgrims to the Shrine of Guadalupe, situated in the suburbs of Mexico City, and their average revenue from the traffic to this and other shrines exceeds £30,000.

Mexican railways derive much revenue from the running of excursions to various towns where there is a happy combination of religious and gambling "fiestas." These, perhaps, are more popular with the péon as they allow him to attend to his soul's salvation and, at the same time, to indulge the lighter side of his nature.

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Mr. I. T. Williams, Chief Goods Manager, London and North Western Railway.

Photo] [*Elliott & Fry.*

WE are pleased to record the appointment of Mr. I. T. Williams as Chief Goods Manager of the London and North Western Railway, from January 1st, 1914. Mr. Williams has been associated with the London and North Western Company since 1876, and, during that period, has held various positions in the South and Central Wales districts, has occupied the post of District Goods Manager of the Warrington District, and, in 1907, was transferred to London as Traffic Superintendent at Broad Street. After retaining the last-named position for just over four years, he was, in December, 1911, made Assistant to the General Manager, with headquarters at Euston, to deal with Labour questions and the work in connection with the Conciliation Boards. The varied experience which Mr. I. T. Williams has had in both Traffic and Goods Departments, together with an intimate knowledge of Labour problems, will be of material assistance to him in his new position.

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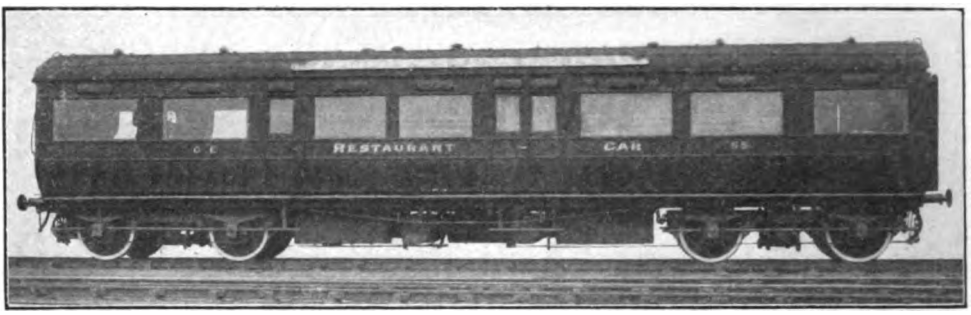

RESTAURANT CAR FOR NORFOLK COAST EXPRESS: GREAT EASTERN RAILWAY.

Passenger Carriages of British Railways
(No. II.).

By BASIL MERCER.

PULLMAN cars are no longer used on the Midland. Some years ago they were all taken over by the company and converted into rail motors or third-class picnic saloons, the British built dining and sleeping cars proving more suitable. One old coach is worth a passing glance, the Manchester "Palace" dining car. This was a beautiful vehicle, running on two six-wheeled bogies and having a clerestory roof. The interior, which was equipped by the then firm of Gillow, contained much fine brass-work and was divided into three parts, one upholstered in pale blue, one in pale pink, the other in pale green, the material being satin. It ran as a first-class car in the London-Manchester service for many years, and may still be seen, though shorn of its glory, blue cloth having been substituted for the satin. The joint stock for the Scotch services is all built at Derby, both Midland and Glasgow and South Western, and Midland and North British. All of it is very good, but as it is exactly like the best Midland stock already described no further mention is necessary here. The colour of both the above-named, as of Midland coaches, is a rich dark red; the coaches are well-kept and look very handsome in their ruby livery.

The London and South Western Railway was some time in adopting corridor carriages and dining cars, but when it did so the work was done thoroughly. Even comparatively slow trains like the 8.50 a.m. *ex*-Waterloo, have restaurant cars. The corridor stock now in use on the main routes is about 56 ft. long and weighs as a rule 28 tons; it provides comfortably for the three classes (second is still retained on this line), and rides well. The dining cars, all composite with the kitchen in the centre, weigh about 32½ tons., and have clerestory roofs. The latest cars, however, weigh 34½ tons, have the kitchen at one end, and the elliptical roof; the class distinction has been abolished. Having no night trains, this company does not require sleeping cars, though some very nice vehicles—the first in the country to have beds instead of berths—were built to run in the American boat trains up from Plymouth. These cars, like all South Western bogie stock, ran on eight wheels; the company has no twelve-wheeled vehicles. Non-corridor carriages are used on the slower main line trains and some of the Bournemouth expresses. It must be remembered that passenger journeys are relatively short as compared with the traffic of the Northern lines, and there is not the same need for corridor vehicles. Bogie coaches are generally used on roadside trains, even at the extremities of the system, while the short branches are worked by neat little sets of six or four-wheeled carriages.

The suburban traffic is very large and a good deal of attention has been devoted to providing suitable stock. With a very few exceptions all the suburban services are worked with close-coupled bogie trains, wisely made up in sets of four so as to admit of division in the slack hours. These trains give very comfortable accommodation with reasonable economy. The lighting, electric, is good and the riding admirable. For the outer-suburban traffic the older bogie stock is used, made up into sets, the set-train principle having been very thoroughly

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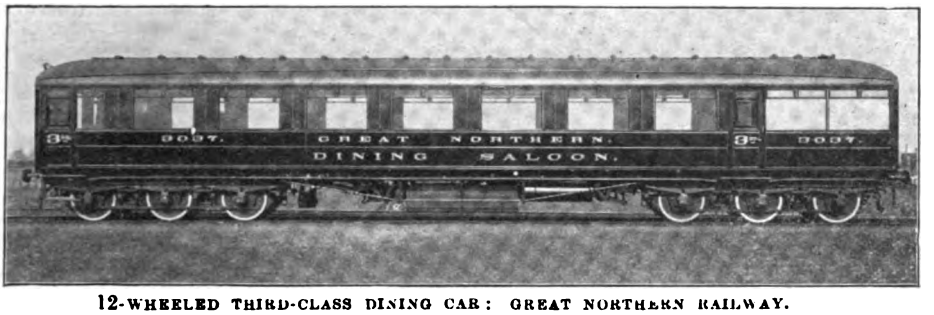
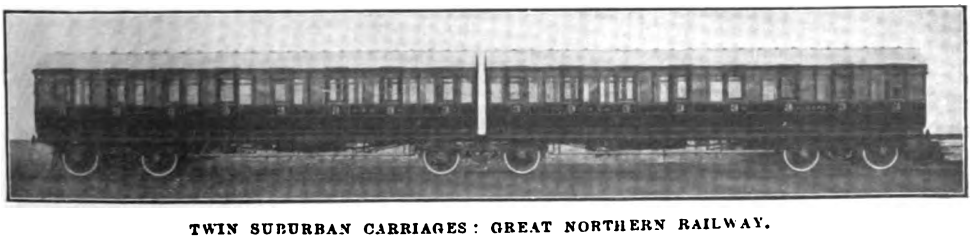


12-WHEELED THIRD-CLASS DINING CAR: GREAT NORTHERN RAILWAY.

carried out on this line. Cleanliness of stock is a feature of the South Western, this attribute giving full display to the colours —buff upper, maroon lower panels. The effect is very pleasing and most trains are symmetrical, every vehicle, even four-wheeled milk vans, being built with the elliptical roof.

In recent years the improvement of stock has been very marked on the London, Brighton and South Coast Railway. Although bogie stock is largely in use, there are still many non-bogie vehicles working on main line trains; the bodies of some of these coaches are now being mounted in pairs on a long underframe with two four-wheeled bogies, and the result of the metamorphosis is quite satisfactory. The interiors are also much improved, though the firsts and seconds (now converted into thirds) were always good. In the new stock the high roof is adopted and rather more lavatory accommodation is provided. The modern firsts are very good indeed, especially those on the "first class only" trains leaving Brighton at 8.45 a.m. and London Bridge at 5 p.m. Distances rule short, so corridor stock is not really necessary; but of other types many interesting and well-equipped vehicles are employed Well designed set trains of bogie vehicles are used for suburban traffic. The new electric trains are very nicely fitted up and ride well. Present coaches are painted a handsome dark brown, a pleasant change from the dingy red of the old coaches. Several experiments were made before brown was chosen, white upper panels and brown lower appearing for a time, while another effect was white upper and green lower panels; both have now been discarded. Pullman cars, so extensively used on this line, are not "Brighton" property and will be dealt with later.

In spite of the fact that the South Eastern and Chatham is often held up to ridicule (very unjustly as a rule) by the halfpenny press, it has a very good average of stock. Even in the old days before the amalgamation the South Eastern had much good bogie stock, while Mr. Kirtley's bogie coaches on the Chatham are some of the smoothest riding types of coaches to be found anywhere. Of the earlier period also are the Folkestone and Hastings "American Car" trains, both of which are comfortably fitted and ride well. For suburban traffic the South Eastern had a bogie train in the 'eighties, and there are now many such trains, particularly for the outer zone, where some very nice sets of eight-wheelers are used. This stock is quite as good as anything the larger lines can show on a similar service. The modern boat train coaches are very fine vehicles. Ample lavatory accommodation is provided, and there is a great variety of styles of compartments to choose from, including semi-saloons for both first and second-class passengers. The standing colour of the Managing Committee is a shade of lake, somewhat similar to the old South Eastern colour, but lighter; the old Chatham stock was varnished teak.



TWIN SUBURBAN CARRIAGES: GREAT NORTHERN RAILWAY.

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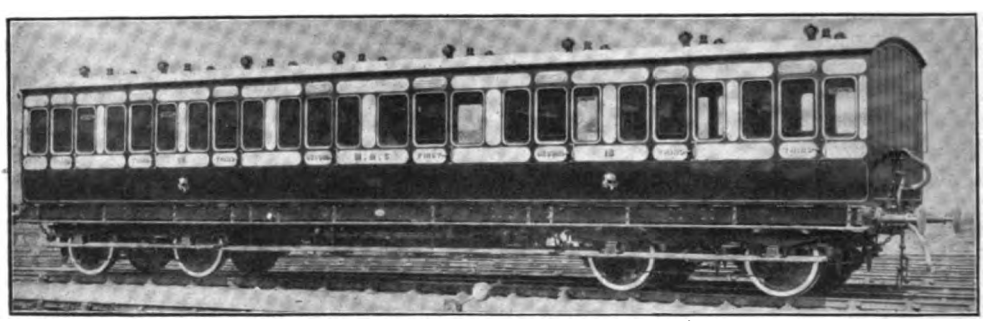
Vast strides have been made by the Great Eastern Railway in respect of rolling stock since 1900, when bogie stock was almost unknown and a vestibuled train something to look for in the dim and distant future; to-day, the main line stock will compare favourably with any in England. The most important expresses are formed of vestibuled corridor stock, the standard pattern having high roofs and running on two four-wheeled bogies. The only twelve-wheelers on the main line are a few of the older restaurant cars. There is also a good deal of semi-corridor stock, some with clerestory, some with high roofs. These are generally composites with a luggage cupboard, and lavatories for both classes reached by short corridors. The restaurant cars are very nicely fitted, both first and third, and there are plenty of them, as a glance at the time table will show. The remainder of the main line stock is composed of six-wheelers, the thirds being six-bodied; but even the oldest coaches are attractive inside and comfortable. The usual suburban set is composed of from 15 to 20 four-wheelers, seating six-a-side in the seconds and thirds and five-a-side in the firsts. New trains are now composed of bogie stock, consisting of eight high roofed coaches, the arrangement of compartments varying according to the services they work. There is also another bogie suburban train, built some years ago, in which all the vehicles were twelve-wheelers, except the two end coaches, which had eight wheels. The standard colour is varnished teak. All things considered the stock is well kept and a train of new coaches looks extremely well.

On the Great Northern Railway non-bogie stock was at one time rather too predominant for modern ideas; as on the London and North Western, there was a determination to avoid the bogie, and some eight-wheeled "rigid" coaches were turned out as a last effort in that direction. Since then, however, the Great Northern has taken a leading position in respect of excellence of main line rolling stock. The high roof is gradually ousting both the clerestory and the old elliptical roof which was so long a typical feature of Great Northern practice. Having a heavy long distance express service, restaurant cars and vestibule corridor stock is met with frequently. Semi-open vehicles have been adopted to a considerable extent; this arrangement gives an air of spaciousness without unduly destroying the privacy so dear to English travellers. The restaurant cars are of varying ages, but the later ones are very fine, and at King's Cross may be seen one of the most attractive dining cars in the country. This is the first class car built for the joint Great Northern and North Eastern trains to Newcastle. The internal decoration of this vehicle was carried out by Warings, which firm adopted a charming scheme in white and green with lights recessed over the cornice. There is another splendid car now running on the 1.40 p.m. Harrogate express, which is also upholstered in green and white. A special feature of the coach is that the furniture (Chippendale) is movable, not fixed, as is the usual custom in dining cars; this coach, which has a kitchen as well, seats 18 passengers and weighs 32½ tons.



COMPOSITE CARRIAGE: MARYPORT AND CARLISLE RAILWAY.
Built by Messrs. Hurst, Nelson & Co., Ltd.

We have seen that the London, Brighton and South Coast (also several other railways) have commenced to turn six-wheeled vehicles into bogies by mounting two bodies on one frame; the Great Northern have also rebuilt some old coaches, but the method employed is not quite the same. The bodies

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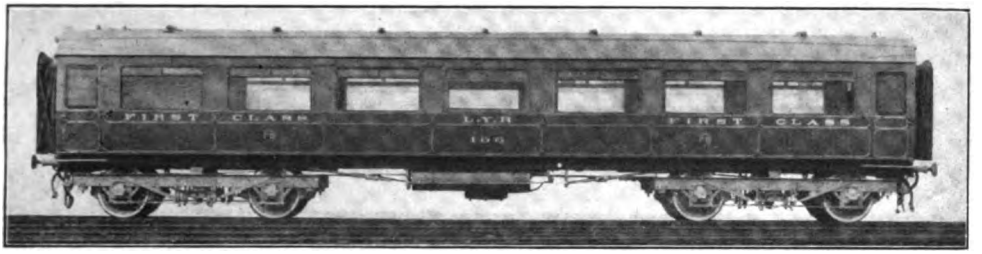
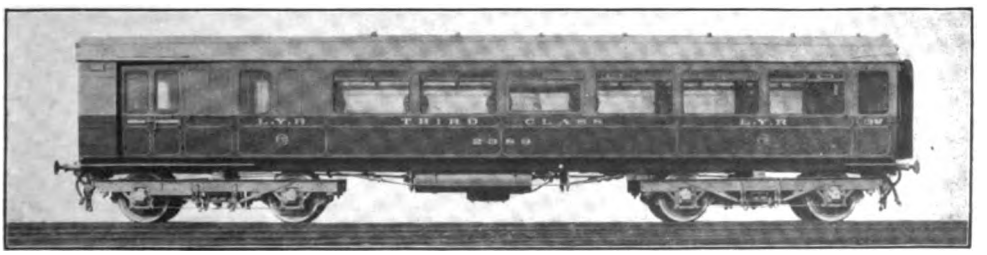


FIRST-CLASS VESTIBULED CARRIAGE: LANCASHIRE AND YORKSHIRE RAILWAY.

of two six-wheelers are close-coupled and mounted on three four-wheeled trucks, one at each end of the vehicle, the other in the middle underneath the coupling. The twin carriage thus constituted rides very comfortably and weighs 37½ tons; the two coaches when running separately weighed 17 tons each. New suburban trains of this pattern have been turned out, replacing the four-wheeled close-coupled sets hitherto employed; the latter were big coaches for four-wheelers, the thirds having no less than six compartments. East Coast Joint stock was formerly built solely at Doncaster, but the three partners make contributions now, so this will be dealt with later. The Great Northern colour is varnished teak.

Before the London extension was made the Great Central (then Manchester, Sheffield and Lincolnshire) conducted its passenger traffic almost entirely with six-wheeled stock, though there were a few eight-wheeled bogie composites. For the opening of the new line much new stock appeared, including eight-wheeled bogie carriages with elliptical roofs and eight-wheeled restaurant cars with clerestory roofs. There are also a few twelve-wheelers, some of which are restaurant cars, the others being used for rail motor services. The London trains used to consist of five vehicles, two brake composites, two cars (first and third) and an eight-wheel kitchen car, similar in appearance to the diners, with some seats in it, A buffet car was also included in some trains, but, though quite a good idea, it has now been discontinued. The next type of coach to be built was a clerestory bogie carriage, Main line trains generally have some of this stock in their composition; they are, as a rule, semi-corridor. Newest of all are some straight-sided trains, match-boarded and with brass initial letters; these are eight-wheelers and vestibuled, and contain a number of novelties in carriage construction. The Great Central has a considerable local traffic in the London district and has built some very good trains for this service. These vehicles are mounted on bogies, and, though the exterior varies a little, all are extremely comfortable. The coaches were formerly finished in varnished teak, This was altered to grey upper and brown lower panels when the new line was opened; and has since been changed to a light brown varnished wood shade.

Suiting the districts it serves, the Lancashire and Yorkshire Railway is essentially a practical company: there is no undue extravagance, but, like the South Western, there is no unsatisfactory stock, the average being distinctly good. Most of the services are worked with eight-wheeled bogie stock, rather light and not luxurious, but roomy and clean. Latterly the high roof has been adopted. There is a fair amount of corridor stock, both for home and foreign traffic, and these coaches may be seen at many termini. A very good train has been turned out for the Newcastle and Liverpool service, having first and third-class dining cars and vestibuled throughout. The earliest Lancashire



THIRD-CLASS BRAKE COMPOSITE VESTIBULED CARRIAGE: LANCASHIRE AND YORKSHIRE RAILWAY.

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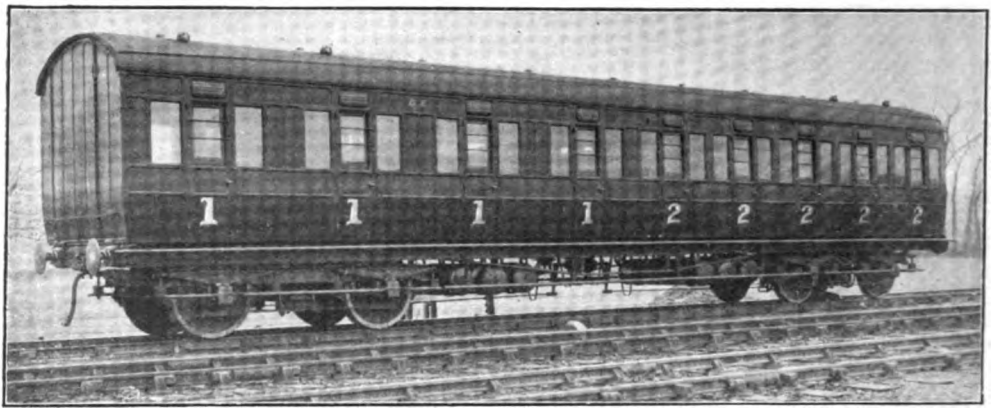

COMPOSITE BOGIE CARRIAGE FOR SUBURBAN TRAFFIC: GREAT EASTERN RAILWAY.

and Yorkshire dining car was of curious design: the kitchen end was carried on a six-wheeled bogie and the other end on a four-wheeled truck. This car had a low roof, but later vehicles have clerestory roofs. The Blackpool Club Train deserves mention as showing what the company can do when special design is called for. Local trains are composed of eight and six-wheeled sets. The Aintree race specials from Liverpool are made up of close-coupled six-wheelers with an electric motor third at each end. The electric trains are extremely good, one coach seating 72 people; there are two varieties, one with straight, others with recessed sides. Entrance is gained through end doors and the riding is remarkably easy. The Lancashire and Yorkshire colours are brown upper and maroon lower panels; this has rather a sombre effect, but the coaches are well kept.

The North Eastern Railway does not possess much corridor stock exclusively its own, the reason being that most of the longer journeys over its metals are made by East Coast or other joint vehicles. It has, however, turned out several very fine trains for the joint service with the Lancashire and Yorkshire Railway to Liverpool, vestibuled throughout and with cars of both classes, and for the London-Newcastle service in conjunction with the Great Northern. Bogie clerestory stock, running on eight wheels, is the usual thing on the North Eastern Railway for all services, though six-wheelers appear on a few branches. Newer stock has the high roof and the interiors of both types are good. Semi-corridor composites are used for through services, and there are some very nice seven-bodied corridor thirds with a lavatory but no vestibule. The standard North Eastern colour is a dark lake. The electric trains round Newcastle are painted red and white.

North British Railway new eight-wheel bogie corridor stock is really very fine; it is comfortable, looks well and rides easily. The dining cars for these trains are twelve-wheeled compartment coaches with four compartments turned into a kitchen, so that, should the company wish to discontinue cars, the coach can easily be converted into an ordinary carriage. The high roof is adopted for the later stock, replacing the elliptical roof of former years. Some of the old stock was remarkably good: there were some seven-bodied corridor eight-wheelers with a lavatory at one end which ride well and are comfortable to travel in. When the West Highland line to Fort William was opened the North British built some centre corridor stock to work over it, and the newer stock for this section is quite up-to-date. Locals and branch line trains are usually composed of mixed stock, but lately some new sets, resembling the new main line stock, have been put into service. The North British colour is a dark lake.

Differing from the North British, the Caledonian build twelve-wheeled vehicles for main line work; this "Grampian" stock is corridor for long distance trains, non-corridor for the Clyde boat and other trains. Shorter eight-wheeled vehicles of the same class are necessarily used on the Callander and Oban Railway. Dining cars are run in some services; these are usually old West Coast twelve-wheel 50 ft. cars.

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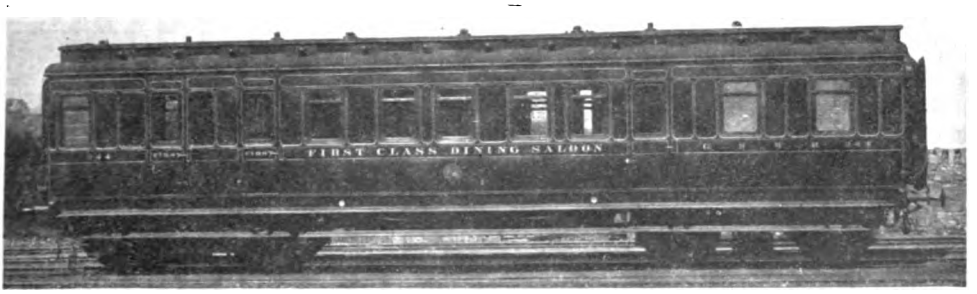
Local trains are frequently formed of eight-wheeled sets, but there are some trains, painted Caledonian black, of close-coupled four-wheelers for certain Glasgow suburban services. All the new stock and most of the old is painted very similarly to London and North Western practice. The Glasgow and South Western Railway has a very good average of passenger stock, albeit it is a line of short distances and the Midland build all the joint stock for the English trains. The company, however, possesses some eight-wheeled corridor stock, twelve-wheeled dining cars and some recent twelve-wheeled carriages including the now usual high roof. There is, in fact, plenty of bogie stock in service. Vehicles are painted dull red. Though only a small railway, the Great North of Scotland has quite a lot of corridor coaches, some running on two four-wheeled bogies, others on six wheels. Bogie vehicles are not, however, very common on this line, though much new stock has appeared in recent years; they are fairly comfortable and have the elliptical roof, the colour being white upper and maroon lower panels.

Highland stock is very good on the whole. The through coaches from London are those of the several companies concerned in the Inverness services, but Highland vehicles work to Glasgow and Edinburgh. Bogie stock is almost universal on any train of importance; most of it is 48 ft. long, some third only, some composites, both with luggage and lavatory accommodation. This stock, though light, rides well, and has a pleasing appearance. There are some newer composites, 56 ft. long; these have the high roof and a corridor down the side of the coach. The through carriage which works on the night train between Glasgow and Inverness has sleeping berths (first) and compartments (third); this coach replaces an old Pullman sleeper. The Highland colour is a pleasing shade of green, and all vehicles, whatever their age, are always clean and in sound condition; the sleepers and some new eight-wheel saloons are, however, finished in varnished teak.

Quite a respectable show is made by the Irish Companies with their rolling stock. The Great Northern (Ireland), whose coaches bear a certain resemblance to those of its English namesake, the lines and colour being similar, has adopted bogie stock freely, its modern eight-wheelers, dining cars included, being very good; this was the first British railway to build a ten-bodied third. The Great Southern and Western has a rather large proportion of six-wheeled stock, but it also possesses some very fine dining cars and corridor carriages, the official colour of which is purple brown. The Midland Great Western has, perhaps, the finest train in Ireland, the "Limited Mail" from Dublin to Galway; this company's colour is now a serviceable dark brown, replacing white upper and blue lower panels. The Dublin and South Eastern is more a short distance line, but it has some bogie stock, a dining car train and corridor coaches; the colour is dark red. The Belfast and County Down shows a good average of stock, with some modern bogie coaches, painted maroon and well kept. The Belfast and Northern Counties (now Midland Railway, N.C.C.) was always well up-to-date; it has good corridor stock and restaurant cars, while the Larne boat train with end platforms to the carriages is quite nice. Main line trains are made up chiefly of bogie stock, painted lake and kept clean.

Coming to some of the smaller lines, the London, Tilbury and Southend, the latest acquisition of the Midland Company, has some very fair stock. The elliptical roofed stock, both six and eight-wheeled, is good; lavatory accommodation is provided in a



FIRST-CLASS DINING SALOON: GREAT SOUTHERN AND WESTERN RAILWAY.

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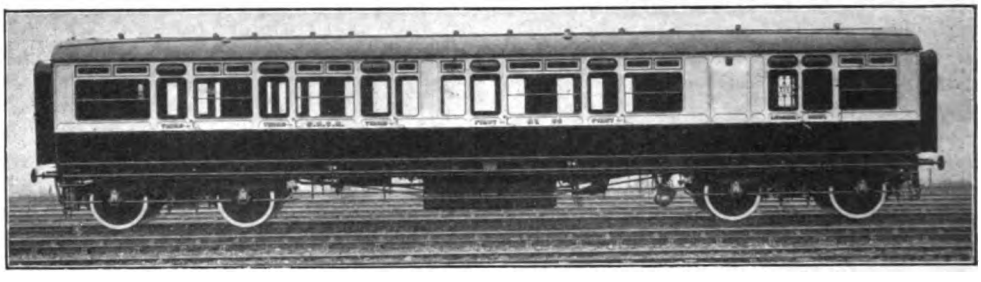
few of the standard bogie carriages, and in the corridor train used for the Ealing-Southend traffic. This train is vestibuled throughout and finely fitted up. Like the rest of the stock it is finished in teak. The Midland and Great Northern Joint Railway has some new bogie vehicles of its own and many older Midland and Great Northern coaches. The Somerset and Dorset has very good stock, mainly its own; there are some fine bogie coaches, in outline rather like South Western stock, but painted a handsome shade of dark blue. The Cheshire Lines Committee also has its own vehicles; the older express stock for the "punctual service" was twelve-wheeled, but has been replaced by eight-wheeled coaches with lavatory accommodation, similar to the Great Central London locals, and very comfortable. The latest style is a Great Northern built train, with carriages similar to that company's main line non-corridor bogie vehicles for the longer runs from Derby to Crewe; the colour is a dull red, well-kept.

Before electrification the Metropolitan used eight-wheeled rigid stock and some very small four-wheelers; the thirds were innocent of cushions, but the old firsts, with their white upper panels, were quite comfortable inside. Following these came close-coupled trains of four-wheeled coaches and then came the bogie sets, which were very satisfactory and rode well. The new high-roofed stock, semi-corridor without lavatories, is also very good. Comfortable stock of the open type is provided for the electric services, while some converted compartment trains are also good. Varnished teak is the standard colour. On the Metropolitan District Railway pre-electric stock was four-wheeled; the electric trains are a nice quiet shade of scarlet.

East Coast Joint stock is built at Don-



VESTIBULED COMPOSITE CARRIAGE: GREAT NORTH OF SCOTLAND RAILWAY.

stock. The old six-wheelers are remarkably roomy, finished, as are the other coaches, in teak. Furness Railway vehicles are very similar to London and North Western stock of a short time back, except that the lower panels are dark blue; it is good as a rule, and there are plenty of bogie carriages. The Cambrian has some good corridor eight-wheeled composites which work to Euston and Paddington, while the Wirral and Maryport and Carlisle Railways make good showing. The North Stafford, like the Lancashire and Yorkshire, is a practical line, so we do not look for extravagant luxury, especially as journeys are so short; four and six-wheeled coaches perform the local work; but there are some very good semi-corridor caster, York and Cowlairs. The stock rules heavy and is remarkably solidly built. The thirds as a rule are good, and the sleeping cars include many devices for the comfort of travellers, such as ventilating fans in the compartments. There are some eight-wheeled cars, weighing 37½ tons (probably the heaviest "eights" in the country), which have beds instead of the usual bunks. The Great Northern teak shade has been adopted as the standard colour for all the joint vehicles.

In recent years Pullmans appear to have come to their own again in England with the latest trains on the Brighton, and the new cars on the South Eastern and Chatham and Metropolitan Railways are very fine.

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The New Locomotive Carriage and Wagon Superintendent of the Caledonian Railway.

MR. W. PICKERSGILL.

MR. WILLIAM PICKERSGILL, who has been Locomotive, Carriage and Wagon Superintendent of the Great North of Scotland Railway for nearly twenty years, has been appointed to succeed Mr. J. F. McIntosh in charge of the locomotive department of the Caledonian Railway. Mr. Pickersgill was born in 1861, and entered the service of the Great Eastern Railway at Stratford in 1876, being appointed Locomotive Inspector in 1883. He remained in the running department until 1891, when he was given charge of the Norwich district as District Locomotive Superintendent. In July, 1894, Mr. Pickersgill succeeded Mr. Johnson as Locomotive, Carriage and Wagon Superintendent of the Great North of Scotland Railway.

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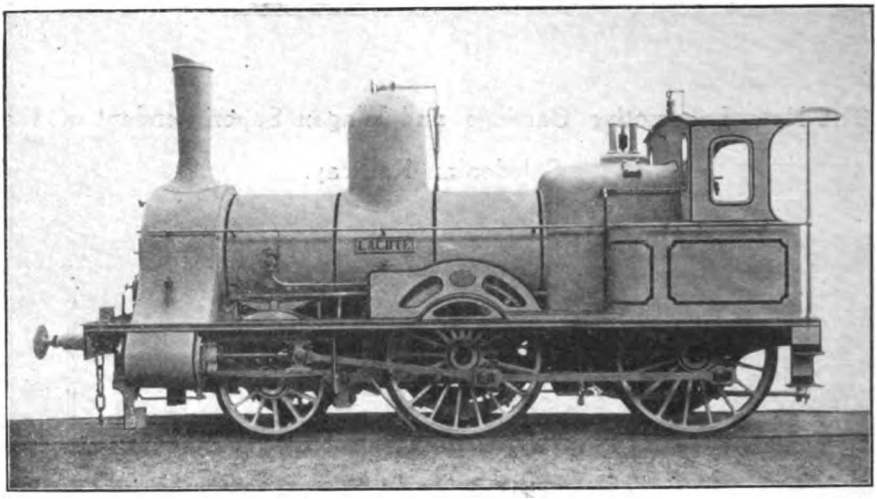

The *Lachte*, shown in the illustration, was one of twenty-five engines of that class, and, I believe, were the first locomotives of the Belpaire type built in this country. Although leaving much to be desired as the barrel portion of the boiler was only 4 ft. 2 in. diameter, nevertheless the results were so satisfactory in steaming, easy and effective washing out, through the coned apertures fitted on the outer corners of firebox, that the writer felt justified in advising the adoption of the Belpaire type of boiler wherever possible in a letter published in the *Engineer* of December 5th, 1879. It will be noticed that the outer shell of the firebox stands much higher than the barrel, and in order to prevent any difficulty from over-feeding a 3½ in. pipe with curved ends united this steam space with the dome. The end in the dome was secured by means of a flange to a perforated disc plate fixed halfway up. Cast iron slide valves and steel tubes were at this time in general use on the Elsass and Lothringen Railways. All engine and tender axles were turned up and polished throughout their entire length, in order to facilitate examination for incipient fractures or flaws.—R.W.

Leaves from the Log of a Locomotive Engineer [No. XVII.].

By ROBERT WEATHERBURN.

MY experience of German methods and trade had been so far confined to countries outside of their jurisdiction, and would have continued so, as the Fatherland had quietly for some years been so protective of its home industries as to practically place an interdict against the importation of English locomotives. Although Krupp's steel in tyres and other special parts, figured in nearly every indent or specification on many English railways, no reciprocal weakness was manifested on their part. A tacit understanding existed throughout the whole of Germany that nothing was to be ordered from England that could be made at home. It required no special legislative enactment: the desire to exclude took deep root in every German mind, and was the natural outcome of German aspiration to obtain commercial supremacy; and to that end, wherever the German is found, at home or abroad, he quietly and persistently works.

The only exceptional instance on record within the last thirty or forty years was when circumstances compelled them to forego this policy in the year 1872. The railways of the newly acquired provinces of Alsace and Lorraine had drained the resources of the new Empire of locomotives, and the main and other lines leading to the frontiers had been depleted of their spare stock. More locomotives were urgently required, and fifty were reluctantly ordered from England. These were four wheels coupled, outside cylinders, cast iron slide valves, with boilers of the Belpaire type. Although the main features of the engines, as regards boilers, frames and wheelbase, were essentially German, yet some considerable latitude had been allowed to makers in the arrangement of other details. The engines when finished

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were sent by way of Antwerp—where the boilers with frames and cylinders were mounted temporarily on wheels for conveyance by way of Luxembourg to Montigny by Metz, where they had to be put together—and indeed in some cases partly erected there. The Bavarian firm of Maffei, of Munich, also sent some very serviceable engines at the same time, but these were delivered whole and ready for the road.

Alsace, the old pleasure ground of France, was no pleasant place at that time. The whole population were sullenly reticent and smarting under a military régime arbitrary and exacting as their former government had been indulgent, and viewed every newcomer with suspicion. The arena of conflict had been swept up and made as orderly as circumstances would permit. The conquerors were no sooner in possession than they at once commenced to improve upon the old fortifications. New batteries for the heaviest ordnance were being constructed in places never dreamed of by their predecessors. Night and day gangs were ceaselessly at work increasing the natural and artificial strength of the city and its environs. Aerial tramways, like gigantic spider webs, were stretched over hill and dale. Masked railway lines connected the distantly placed batteries and outlying forts, over which traffic was being constantly conveyed. The ancient ramparts were being improved, and advanced lunette batteries placed in positions that came as a surprise to the careless pedestrian. Huge turrets and mighty mounds of earth were slowly, day by day, growing in magnitude, all showing the inflexible resolve of the victors to hold in perpetuity what they had gained in that brief but gigantic struggle. "Spoils for the Victors!" But no rest, from the early sounding reveille, to the last blare of the trumpet at night. The very atmosphere was infected with military activity. It might have been actual war still, or preparations for such, instead of a time of peace. No rest for the Victors! Splendid monuments (a proof of active consolidation) were being erected to commemorate the battlefields and mark the resting places of the German dead, more particularly at Borny and Gravelotte. The German government had already shown a paternal regard (no doubt influenced by the knowledge that the conquered had to pay) for the resting places of the meanest of her soldiers, as was evidenced by the numerous crosses, here and there, which dotted what had been the line of advance. Up the rising ground at St. Privat, by the dusty chaussée through Thionville and Rezonville, in the green fields, on the wooded slopes, right up to Gravelotte, there the dead were commemorated by massive monumental stonework; one could trace by means of these sad memorials the history of those memorable days, but the most pathetic sight, in my opinion, after that of the ruined condition of the now historical village of St. Privat, was that of the small village of Ste Marie au Chêne, for there the vine trellised walls of the village gardens had been carried by assault; and in small garden patches, which were even then being thriftily cultivated, were dozens of small crosses shewing where the defenders were buried. Even some of the mounds were being utilised for the growth of salad, although ploughing was strictly prohibited in certain places in and about the battle fields, where the buried dead had not yet resolved themselves into mother earth, although quicklime had been unsparingly used by the German burial parties.

The French peasantry were sullenly apathetic and cowed by their misfortunes. Those who had formerly boasted of their ability to speak the two languages of the province now pretended ignorance of the German, and it was difficult for a stranger to obtain the courtesy of a reply, if addressed in the language of the conquerors, more particularly in the outskirts. The old popular restaurants and Café Chantants in the city of Metz, and the comfortable vine wreathed auberges with pleasure gardens in the outlying villages of Sablon and Montigny, which during the old régime were the haunts of the military and happy bourgeois, where song, dance and merriment were heard every day, and often deep into the night, during the pleasant summers of that lovely province, were deserted by their old proprietors and were then under German management, patronised no longer by the rich proprietors and peasantry, dull and uninteresting to a degree, frequented only by *unteroffizieren* and some of the numerous officials of a bureaucracy, the most complete, yet the most unintelligible, to outsiders, in the world. The conquerors made themselves known and felt, both by demeanour and words which stung the yet unhealed sensibilities of the conquered. *Par excellence*, the German when abroad and craving favour or indulgence is an angel of courtesy and demeanour, but when highly placed, or a conqueror, more arrogant and boastful than an ancient Babylonian. In those days of which I am speaking, although socially

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recognised, the patronising and arrogant air and the oft repeated tales of personal experience and incidents of the war made their society an intolerable bore. At this period, and later on, they were sorely afflicted with what is vulgarly called "swelled head," and treated those who were unable, or unwilling, to leave the Province with great harshness, so that many serious affrays took place which never found their way into print.

Not an employé of the old Companies was retained on the official staff, and only those who foreswore all things French in future were retained in very subordinate positions. Their self sufficiency was not confined to military matters, as was evidenced by the prejudiced opinions and judgments passed on the English engines before ever they were tried. It is as well to state that these engines were made to imperfect specifications, hence many of the details were left unfinished, to be dealt with on the spot to suit their requirements. For example, the slide valves, although stipulated to be made of cast iron, were so indefinitely defined as to the qualities of admission, cut off, and release, that they were sent with a slight extra margin of inner and outer lap to be altered to suit the working requirements, and in making these provisions, we were apparently complying with the drawings.

When the first engine was ready for the trial run, from Metz to Amanvilliers, several specialists crowded the footplate, each man noting the performance of some particular part. The engine was sluggish, and these semi-military-clad engineers were assuring each other that this was exactly what they had expected and all along foretold. It only required a general shake hands to confirm the pleasure which they experienced at this contretemps. I told them that the morrow should see the engine in a condition to compete against any engine of a similar size and pressure they should think proper to bring. They cynically advised me to postpone further trials for a week to make sure. On the following day I had all ready, and took the regulator myself, and got up a speed, both up hill and on the level, that, on our arrival at Montigny from Aars-sur-Moselle, made them acknowledge the trial a success. I had simply reduced the outside lap by two millimétres and widened the exhaust cavity by one.

I must, however, in common honesty, say that the most objectionable type of German official was the Prussian, who was often the incarnation of studied offensiveness and intolerance. At this time he was as cordially disliked by the South Germans as by anyone.

Ich bin ein Preuss
Du kennst meine Farbe,

was not only his song, but also his psalm and evening hymn. At the bottom of this self-laudation there was much to be proud of, for the great minds who had encompassed the garotting of Schleswig-Holstein, and brought about the war of 1866, so familiarly alluded to by them as the "six weeks campaign," and which were only the forerunners to the humiliation of France, were surely all from the Northern provinces.

The reader may possibly say that the experience recorded has only the backing of one mind, and was probably the result of misunderstanding. I can assure him that there was much to try, and also much to amuse, in the officialism that prevailed. Happily the misunderstandings were rare, but the thinly veiled official dislike was always more or less there, in spite of the sturdy common sense and honesty of many who could not help but admire the way in which the work was done, with no further help but such as the offscouring of war had left in the way of drifting Schlossers and disbanded Landswehrmen. What was lacking in friendship was amply atoned for by the interest I felt in the people, and the beautiful country round about; but any display or expression of sympathy with the downcast residents at once evoked bitter feelings and words from the Germans. Nature has been more than a godmother to the majority of Englishmen, and I own that, although ungrateful at times, I am still thankful to know that in every true blooded Briton there is a latent element of patriotism and combativeness, which when once aroused makes him at least respected.

Let it be distinctly understood that my remarks relating to German officialism are not dictated by any other feeling than a desire to speak as I found. Many of my most cherished friends are German, for whom I entertain the warmest regard, and however disagreeable, and at times offensive, their military hauteur and bearing might be, one may greatly question whether any other people similarly successful would have been less bumptious and overbearing.

As a nation, so geographically placed as to have been the battle ground of conflicting interests and ambitions for many centuries, yet under the most disastrous conditions,

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with their capital and country repeatedly occupied by their enemies, they kept the pure fire of an ardent patriotism burning in every German home. They developed and hoarded their physical manhood, and quietly submitted themselves to a régime of preparatory training, of so severe a character that one unconsciously compares them to the old Spartans. Bearing, yet rejoicing, in a military burden which pressed alike on peer and peasant, all contributed to the furtherance and success of the consummate policy so cleverly and clearly planned by their great thinkers, who thought out method and system, whilst accurately gauging the capabilities of their future opponents. United in an unwavering faith in their own abilities, they waited patiently through years of trying preparation, until the time was pronounced ripe for action; and then, in the short space of six years, altered the whole of the political geography of Europe and the world, by dealing a series of stupendous blows which pulverised all opposition, placing, at one final move, the house of Brandenburg at the head of German confederacy, and France under fine and interdict for a century to come.

. . . .

Probably the feeling of jealousy, and sometimes dislike at that time to things English to be found deep down in the official German heart had been intensified by the openly expressed sympathy of the British press with the unfortunate French. Such was the state of affairs when an incident, slight in itself, but which might have been far-reaching, even to my exclusion from the Province, took place. The first carnival held at Metz was a purely German affair, but nevertheless most artistically and elaborately got up. All the German workmen were given holiday and those of the regular population were encouraged to demonstrate to the utmost. On the evening in question I was persuaded by two acquaintances, one a Brunswicker and the other a South German, to go to see the fete in their company. After viewing the procession pass through the Rue de Serpenoise, we mingled with the crowd before the Hotel de Ville, where every conceivable extravagance in the way of dress and folly was being enacted. Flour pellets were being flung in every direction, and whatever incongruity caught the eye became the centre of an active bombardment.

I was speedily recognised by my English felt topper, which at the time of leaving home I had forgotten to change, and at once became the recipient of hundreds of favours in the way of active bombardment. Soon I was hardly recognisable, and it was, I own, with difficulty that I kept a square face until by a rush I got out of the press, and whilst being groomed and dusted down by my two colleagues, became an object of interest to three lusty Prussian infantry soldiers who, arm in arm, came directly towards me. Each man was fitted with a false nose, and like all their class carried side arms.

I had managed with the aid of my left hand friend to divest myself of a portion of the redundant flour and paper which still befringed my felt hat, and had just replaced it, when the middle soldier disengaged himself and struck my hat over my eyes with a blow the force of which drove it on to my nose, knocking the hat completely out of shape and doubled up. Amidst a roar of laughter, which stung me worse than all, I with difficulty unbonneted myself, and straightened the dilapidated structure to the best of my ability. My Brunswicker friend was deeply grieved at my misfortune, and expressed his sorrow for what had occurred. But I bade him be comforted with the assurance that the next man, whoever it might be, soldier or civilian, who took such a liberty must take the consequence.

We had succeeded in crossing over to the other side of the square, when by one of those peculiar chance movements of the crowd, the same three soldiers came again into view, and, full of the devil of mischief, singled me out with a shout of recognition and laughter, due to the miserable ruin of my chapeau, which sat provokingly awkward. My quondam Preuss essayed to send it off with a swinging blow, but—Heaven help him!—he reckoned without his host, for at the same moment I dealt him a blow which doubled up the real as well as the pasteboard nose, and which floored him as completely as though he had been flung there. Whatever may be said about the German soldier, his comradeship is staunch, for while one attempted to lift the fallen man, the other with a howl of rage dashed at me, only to receive the same hard punishment as his comrade, also in the face. The third, undaunted by the condition of his comrades, came open-handed to seize me, and got such a dusting that laid him prostrate like his fellows.

Verily there are times when a man loses his own identity, and becomes a greater surprise and puzzle to himself than to others. Although enraged at my treatment I never

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lost my presence of mind, and never felt more calm, although fully alive to the enormity of striking the Kaiser's uniform, which is the most unpardonable kind of "lésé majesté," Hitherto I had been acted upon; now I felt myself the chief actor, and felt elated when I saw all three down. Without hat, and red with the glow of conflict, I heard my two friends expostulating with the pushing and surging crowd, when suddenly a sergeant of the military police stepped between me and the infuriated soldiers. He was a solidly well-built man, and his appearance seemed to rouse the rowdy soldiers to greater rage, but with his scabbarded sword he pressed them back. The middle one who had provoked the conflict was, like his mates, bleeding copiously at the nose, and had drawn his sword bayonet and tried to make a lunge in my direction; but was restrained by the Commissary, who demanded who had injured his nose. "Der Englander," was the answer, the others were vociferating their claims to be heard, with the same question and the same answer—"Der Englander."

I have ever since had a sincere respect for this particular round-faced representative of law and order, for his emphatic and manly utterance "I shame for you, meine herren, if one man has done this," which speedily received confirmation. My big Brunswicker, knowing the surroundings, now played his part well, for while the crowd was becoming denser, he grasped me by the arm and muttering "Follow quick," led me down a passage close by, between two of the houses on that side of the square, which turned at right angles about thirty feet down, and then through a half opened side door, where to my astonishment a dance was in full progress. "Seize a partner and dance," he whispered hurriedly, "lose yourself." Wiping my face with my handkerchief, and pulling myself together, I turned to a demoiselle who was busily fanning herself and said: "Fraulein wollen sie mittanzen." Her reply was a courteous nod, and lifting her left arm to make room for my right, in another moment I was cross cutting and dodging in the whirl of gaiety, in the densely packed room where the wind instrumentalists could hardly blow for smoke from cigars and cigarettes. After dancing some little time, I took the young lady to a vacant seat close by another door, and murmured my thanks, when a bustling sort of an old duenna-like person twisted the girl round, and seizing the back of her white dress showed her blood stains where my hand had been laid. At first I denied all knowledge of it until on examining the knuckles of my hand I found that they were bleeding, how I know not. I could only surmise that I had injured them in the melée. The bother which ensued would most probably have caused further trouble, had I not begged the girl to accept a large five franc piece as a solatium and then warily made my exit by another way, after which. tying my handkerchief round my head which happily was no uncommon thing at a carnival, I made my way as best I could, without further let or hindrance, to Sablon.

Two days after this episode, I was requested to call upon Obermaschinenmeister Volkmar, the chief of the railway staff, who informed me that he could not be answerable for the result, more particularly if the men demanded my identity. However, knowing what an important factor money was with men who rarely had a groschen to spare, I commissioned an Alsatian, who spoke both languages well, to go to the Eugenie Barracks and soothe their wounded feelings with a thaler apiece. It turned out good diplomacy, as I never heard more from them, but I always think that I owed more to the kindness of my two German friends, who, it appears on their own account, waited on Herr Obermaschinenmeister Volkmar and explained the whole of the irritation and annoyance to which I had been subjected, and also putting forward the excuse that I, being an Englishman, did not understand the license of carnival time. No doubt the combined efforts, and the sense of humiliation incurred at the hands of one man, stopped proceedings that otherwise would have ended in my banishment from the Province. It was not entirely loss on my part, for many of the French residents who got to hear of the fracas were, when opportunity allowed, constantly showing me favours which were well meant, but likely to bear unpleasant fruits if reported. Moral: never go to a carnival, or if so, be a mummer!

Per contra. This world at best is but small. One is taught geographically that its diameter is eight thousand and its circumference twenty-five thousand miles. Nevertheless circumstances contribute to prove that it is relatively small at that. Some years before my arrival in Metz, I was staying occasionally at Pillau, which is the port of Koenigsberg, unloading from the steamers, locomotives intended for the Moscow and Riazan Railway. My German agent and banker was one Georg Malmros. I had

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frequent occasion to do business there, and always found his chief clerk and cashier, Conrad Blumke, a most agreeable and courteous Jew, anxious at all times, when we met, to air his small vocabulary of misplaced English words. Often at lunch time we sat together, partaking of the homely "butterbrod," sprinkled with green cheese, kept grated in a gigantic pepper-box-like apparatus.

When the last consignment was unloaded, I departed to Eydtkuhnen and lost sight and touch with the cheerful Conrad. After that, many events of more than passing interest occurred that banished the recollection of him from my mind, for every day brought new faces and acquaintances which speedily relegated those of a past date to the shelves of memory. Years rolled by and in their course obliteration became a natural sequence. Now it so happened that previous to leaving England for Metz copies of my signature had been forwarded to Berlin to the Government Bankers, Messrs. Delbrück and Leo, for the purpose of identification, as they possessed a branch bank at Metz which was authorised on my demand to supply all money needful for the cost of erection there. On this assurance I contented myself with taking a comparatively small sum in notes and gold for the journey thither, and to last me a few weeks, and when needed could draw upon the Banque Filiale.

With the influx of workmen and the withdrawal of a large percentage of the business people, the few hotels open charged an exorbitant price for the most uncomfortable quarters, so that in a short time my funds were so depleted that I called upon the bank, where I was most courteously informed that they were aware of the arrangement entered into, but that the photo of my signature was not to hand from Berlin, hence I could not draw monies, but would I call again as they were daily in expectation of it. Days went by, every time I called the same answer was given: "to-morrow it will surely come." In the full expectancy that such would be the case, I refrained from writing to England for money until Christmas was close at hand, and I possessed little or nothing wherewith to meet the necessities of that festive occasion. My family were now residing in an old chateau-like structure in the village of Sablon, and had always expected some particular recognition at that time, in the way of celebration and presents. I felt very anxious, as there was no longer time to obtain money from England. I again called upon the polite little manager and explained my position, with the usual response: "I am very sorry, sir, but your signature has not yet come to hand." Vexed and disheartened, I walked away wondering what I should do to tide over the period.

Up to this time I had simply been making arrangements for the reception of the locomotives in parts, and had been for some weeks wandering idly about awaiting their advent. Opposite the old parade ground of the Eugenie Barracks at the corner of the Rue de Serpenoise I had some weeks before noticed a large Cigarren Lager (tobacco shop) which bore the name "Bennett." Now this struck me in a moment as being English, and partly through curiosity and by way of killing time, I went in and purchased half a dozen cigars from the owner who was behind the counter. His answer in English confirmed my conjecture. He told me, as I then thought somewhat reluctantly, that his father was English but his mother German. I congratulated him on having the best tobacco shop, in the best site I had ever seen, for as a rule the shop during and after parade was over was crowded with officers and their servants purchasing the weed either in one form or another. He then told me he had been a camp sutler and on the occupation of Metz by the German army he and a partner of his who was then in Strasburg in a similar establishment had purchased the shop from the former French proprietor for a mere bagatelle, and admitted that himself and partner were rapidly making a fortune. After that day my calls were frequent, indeed, I rarely passed without stopping for a chat.

Coming back to my impecunious condition, on the occasion referred to, I had determined to obtain money, even of I was compelled to raise money on my watch (Count Bobrinsky's present), since, much as I disliked the idea, I disliked still less facing the merry Christmastide with empty hands for those who had always received the customary gifts. When I got to the corner I found the shop crowded with purchasers, for the troops had just been disbanded from parade, officers and non-commissioned and orderlies waiting their turn. Everybody had money, so I must perforce wait until the shop was cleared. When the shop was empty I entered shamefacedly, more like a thief than an honest man, and after exchanging the usual salutations and purchasing a small package of tobacco, I proceeded to explain my position to Bennett, telling him of the

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signature, etc., and finished by taking out my watch and asking if he would kindly advance me a matter of a hundred francs thereon. There was for a moment what appeared painfully to me to be a hesitancy on his part, but he took my watch and put it in the cash drawer behind the counter. I was dreadfully fidgetty for fear that anyone might come in and see the transaction, and just at that moment a man entered the shop, and paused within the doorway; there was a pleasant cry of greeting for him from Bennett, which caused me to turn my hitherto partly averted face. The man saw me, and at once, in the most excited manner possible, exclaimed, "What, is it possible? yet it must be my dear Englander," and with that he embraced me most cordially in the Continental fashion.

Bennett looked amazed, and could not understand how his partner from Strasburg could claim old acquaintanceship. I was equally surprised and pleased to find that it was Conrad Blumke, once chief clerk and cashier to Georg Malmros in far away Pillau, on the shores of the Baltic. Many were the hearty shakes of the hand I got, and mutual explanations of our being in Metz. He had been drawn in, and disbanded at the closing scenes of the war and had then joined Bennett. At last Bennett, recollecting my errand, commenced to count down the hundred francs, when I laughingly explained my dilemma to Conrad; as he grasped the position the smile left his face, and a look of profound mortification came over it, and turning instantly on Bennett asked: "Have you his watch?" Bennett replied that it was in his drawer. Conrad sprang over the counter, pulled the drawer open, and handing me the watch begged my pardon for the mistake, as he was pleased to term it, his partner had made. "He did not know you as I do," he remarked, and then asked me as a favour to accept the loan of two, three or five hundred francs, indeed whatever I wanted. With much difficulty I got off with two hundred, for he would willingly have pressed me to take the five.

Strange to relate, my signature came the following morning. This goes to show that the Jew is much maligned on the Continent, and proves that friendship is stronger than usury.

In view of the interest attaching to the locomotives built by Messrs. Kitson & Co., Ltd., for the Elsass-Lothringen Railway, the following list of dimensions will be of interest:—

	Passenger.	Goods.
Type of engine ..	2–4–0	0–4–2
Cylinders, diam. ..	430 mm.	418 mm.
,, stroke ..	576 ,,	602 ,,
Coupled wheels, diam.	1752 ,,	1431 ,,
Running ,, ,,	1235 ,,	1117 ,,
Tender ,, ,,	1072 ,,	1072 ,,
Coupled wheelbase ..	2040 ,,	1726 ,,
Total wheelbase, engine	4470 ,,	4342 ,,
,, tender	3040 ,,	3040 ,,
Boiler heating surface—		
Firebox	6·08 M2	7·43 M2
Tubes	100·23 ,,	90·56 ,,
Total ..	106·31 ,,	97·99 ,,
Grate area	1·51 ,,	1·57 ,,
Number of tubes ..	184	184

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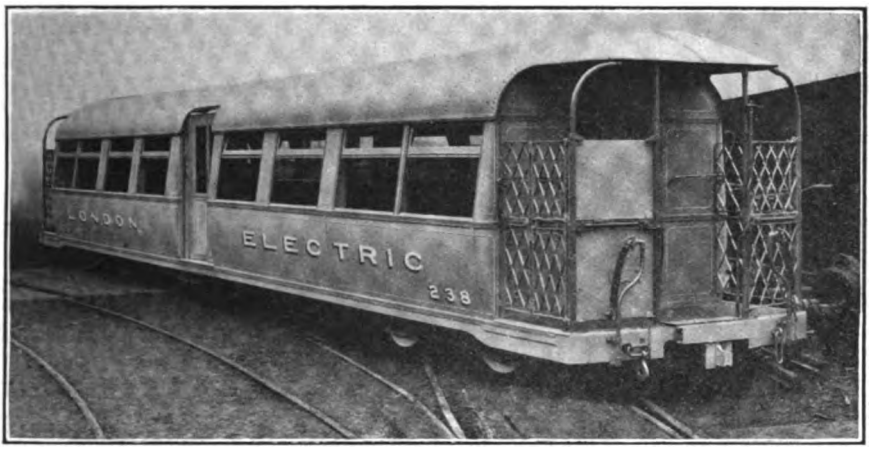

NEW ALL-STEEL COACH: LONDON ELECTRIC RAILWAY.

Steel Rolling Stock on Underground Railways.

THIS subject has been much to the fore during recent years, and numerous references have been made to what is being done in this connection on the London Underground Railways. As a rule, however, remarks have been of a more or less general character; but it is thought that a comprehensive review of the present situation in this respect, with particular reference to the lines controlled by the Underground Electric Railways Company of London, Limited, will be of interest.

In 1910 the Metropolitan District Railway introduced steel coaches into traffic, and at present 46 motor cars, 20 trailer cars, and eight of each type belonging to the London, Tilbury and Southend section of the Midland Railway, are in service. Of this total of 82 vehicles, 52 were supplied by Messrs. Hurst Nelson and Co., Ltd., and 30 by the Metropolitan Railway Carriage, Wagon and Finance Co., Ltd. These include steel framework and steel exterior and interior panel plates, together with many aluminium fittings and details, while the floors are of steel plates. Where wood or other materials are used they are specially treated to render them non-inflammable. A further series of 26 motor cars and four trailers of the same class are now on order and will shortly be delivered by the Gloucester Railway Carriage and Wagon Co., Ltd. These cars are similar to the other steel cars in service except that an arch roof has been adopted and a composition floor. The amount of wood used in construction has been reduced and metal mouldings used throughout for interior decoration.

Steel coaches have been used for a considerable period on various sections of the London Electric Railway, and at present there are in service 168 motor cars and 306 trailer cars, a total of 474. In addition to these, 10 steel motor cars have been recently delivered by the Brush Electrical Engineering Co., of Loughborough. These new cars are provided with middle doors in addition to the ordinary end gates. There are also two motor cars and two trailer cars under construction by the Leeds Forge Co. These cars are also fitted with middle doors.

A progressive development towards the ideal "all-steel" construction and the minimum of material requiring special treatment to render it non-inflammable has been realised in successive orders. The highest stage of development is shown by the four new "Bakerloo" coaches now being supplied by the Leeds Forge Co., Ltd. These cars are similar to the steel stock in service, except that arch roofs have been adopted and an extra door has been provided in the middle of each side. The middle doors are independent swing double doors fitted with self-closing mechanism and checks, the mechanism being under the car floor

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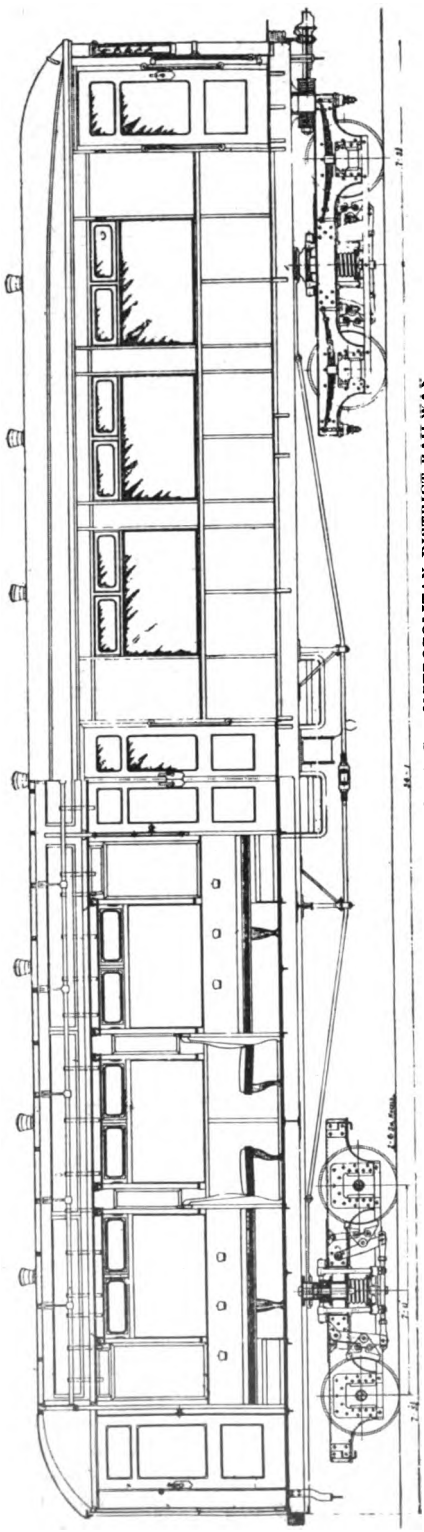
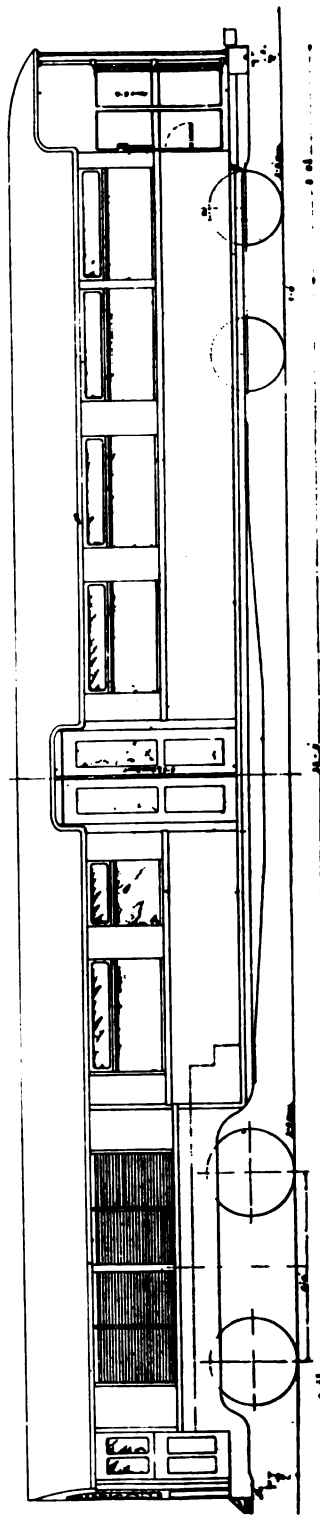


NEW ALL-STEEL ARCHED ROOF TRAILER CAR: METROPOLITAN DISTRICT RAILWAY.



NEW ALL-STEEL MOTOR CAR, WITH ARCHED ROOF AND MIDDLE SWING DOORS: LONDON ELECTRIC RAILWAY.

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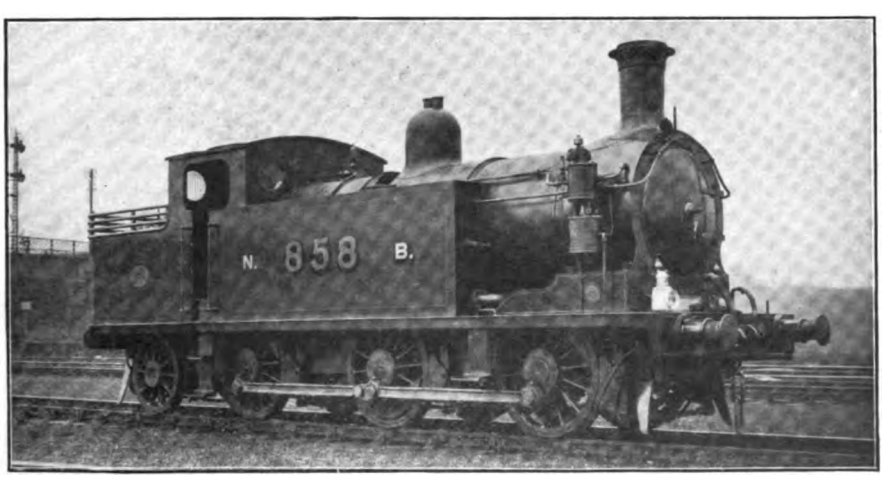
and acting on the door through a rocking shaft. The doors are locked by means of overhead latches electrically connected with switches on the operating gear of the end gates, so that when the end gates are opened the latches are raised by means of electro magnets, which allows the doors to be opened. This also lights up a small red bull's-eye near the gateman's position, indicating to him that he must not ring his starting bell. When the gates are closed the latches drop, and when the middle door swings to it locks itself and a green bull's-eye is lighted up in place of the red one, indicating that it is safe to start the train. The apparatus is arranged so that it can be operated in connection with the gates at either end of the car as desired but not from both at once, and means are also provided so that when desired the end gates may be opened without lifting the latches or the latches may be raised without having to open the end gates. The cars will be fitted with spring seats upholstered in moquette velvet, and equipped with emergency lighting supplied from an accumulator and automatically switched on if the traction current should fail. Existing stock is also being equipped with emergency lights.

On the Central London Railway six steel vehicles, built by the Birmingham Carriage and Wagon Co., Ltd., are in use, and 24 additional motor cars of a special design are on order in readiness for the opening of the Ealing extension, which is expected before the end of the year. They will be equipped with more powerful motors than those at present in use, and will be supplied with middle doors.

For working over the London and North Western Railway to Watford *vid* the Baker Street and Waterloo line, special vehicles are being designed. This stock will be arranged to suit the different heights of platforms on the tube railways and the main line sections, and will be designed to attain speeds of about 50 miles per hour when running on the Watford line. The cars will be of steel construction and completely vestibuled at the ends.



NORTH BRITISH RAILWAY:
0–6–2 tank engine bearing large numerals to facilitate the worikng of the Control System.

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The Line of the Wide Horizon.

UGANDA RAILWAY ADVANCEMENT.

AS "A Railway through a Zoo," the Uganda Railway has been the subject of many newspaper articles, while much journalistic ink has been spilt in describing the territory it serves as "The Big Game Hunter's Paradise." The story of this unique railway is, however, by no means complete. Development, improvement and extension is the order of the day, and much still remains to be done to utilise to the full the advantages afforded British East Africa and Uganda by this striking example of British enterprise and engineering skill.

From Mombasa to Lake Victoria Nyanza, 584 miles, the line passes through the finest big game country imaginable, offering a choice of altitude and climate unequalled in the world. A journey across the Great Rift Valley, through the mountains and forests of the East African Uplands takes one to a height of 8,340 feet, and offers travellers a continuous panorama of the most novel and interesting character Nature ever produced. The thousands of wild animals seen from the line of this famous railway constitute a unique feature of travel thereon.

In the earlier days of the Uganda Railway efficient working was handicapped very much at times for want of goods vehicles and engines, but in 1912 orders for rolling stock of this description were placed in England, and already three shunting engines, eight Mallet articulated compound engines and 110 wagons of 20 tons capacity have been delivered. In addition there are on order or in course of delivery five tank engines (2–6–4), 10 Mallet compounds, seven goods engines (4–8–0), 90 20-ton covered wagons, of special type for carrying soda in bulk; 145 20-ton wagons, 105 of which are covered and 40 open; 50 10-ton four-wheeled covered wagons.

The Mallet engines are of a powerful type for a metre gauge. The wheel arrangement is 0–6–6–0. Weight in full working order is 59 tons 17 cwt., all of which is available for adhesion. Tender tank capacity is 2,000 gallons, with 270 cub. ft. fuel space; weight, 31 tons 14 cwt. Cylinders, high pressure 15½ in., low pressure 24½ in., with 20 in. stroke. The Mallet engines will haul 300 tons gross up the 2 per cent. grades and 500 tons gross up a 1·15 grade.

All coaching stock is built locally at Nairobi, the frames, wheels and axles being imported from England. New first-class stock is of the bogie pattern. Electric lighting is taking the place of oil as an illuminant.

From the coast to Nairobi, Tyer's tablet working is being installed, but the remainder of the line is worked on the Indian line clear ticket system. There is at present no interlocking.

Most of the guards are Europeans, and the employment of Europeans is on the increase, but the drivers at present are frequently men of colour.

The steamers owned and worked on Lake Victoria by the Uganda Railway administration have proved a splendid investment, as they are earning over 12 per cent. on the whole capital outlay on the lake trade (including cost of steamboats actually working), wharves, sheds, etc., but excluding three new vessels about to be brought into use.

At present the steamers burn wood, but before long it is expected all will be consuming oil fuel, thus freeing more hold space for cargo.

Three branches serve the Uganda Railway proper—the Busoga Railway, connecting Lake Victoria with Lake Kioga, the Magadi Railway and the Thika Tramway.

In April, 1913, the Uganda Railway took over the Uganda Protectorate steamers of Lake Kioga, and now work them in conjunction with the Busoga Railway.

The Magadi Railway is a branch from the main line and runs to the soda deposit of Lake Magadi. The line is being built by a

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company. Rails reached Lake Magadi in August, 1913, and it is expected to be finished early in 1914 and carry over 50,000 tons of soda before next New Year's Day.

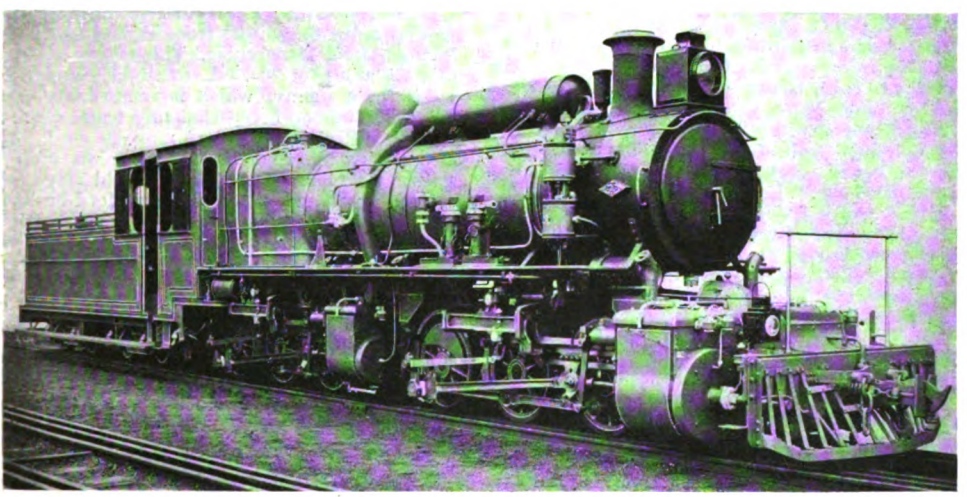
The Thika Tramway is a small branch from Nairobi to the Thika River. It taps an agricultural district of growing importance. The East Africa Protectorate Public Works Department was responsible for the construction of the line, which on its completion was taken over and is now worked by the Uganda Railway.

Figures illustrate the progress of the Uganda Railway: Total tonnage 1907–8, 54,855 tons; 1911–12, 115,768 tons; 1912–13, 200,000 tons (approximate).

writing recently, states that one of the most pressing needs of the East Africa Protectorate is better harbour facilities on the coast. He further adds that a large number of European settlers living on what is known as the Nasin-Gishu plateau, about 90 miles from the Uganda Railway, are urging the Government to build a railway to link them up with the Uganda Railway.

There is likewise a proposal to construct a line from Kisumu, the terminus on Lake Victoria, to Munias. Such a line, which would be 40 miles in length, would pass through a thickly populated country.

Headquarters in Africa of the Uganda Railway are at Nairobi, where in addition to



BRITISH BUILT MALLET LOCOMOTIVE: UGANDA RAILWAY.

Hitherto there have been four through passenger trains per week, but now in 1914 there is daily service in operation between the coast and Nairobi. There is a local service between Mombasa and Mazeras, with two up and down trains per day. Natives use these local trains largely, as many as 16,000 per month being carried; but they have been somewhat shy in using the railway as a whole and as a special inducement to them to journey by train cheap fares at the rate of $\frac{1}{6}$d. per mile have been introduced for coloured people travelling in parties of ten or more.

Considerable development in goods traffic during the next few years is anticipated.

Mr. G. H. Stanley, the Traffic Manager, the offices of the General Manager, Mr. H. B. Taylor, are located the Engineer, the Locomotive Superintendent and the Traffic Manager. The British representative, Mr. D. G. Longworth, has offices at Dewar House, Haymarket, London, S.W.

At present the Uganda Railway is but in its callow youth. A system with great prospects before it, to the fancy title beforementioned a second might be added: "The Line of the Wide Horizon."

Facilities provided by the Uganda Railway for sportsmen and tourists are rare and unique, but as a civilising factor and a commercial proposition in East Africa it not only commands success—it undoubtedly deserves it.

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PERTINENT PARAGRAPHS

A Notable Prize Competition.

To celebrate the publication of the 200th monthly issue of the RAILWAY MAGAZINE, the Editor will award a First Prize of Two Guineas, two Second Prizes of One Guinea each, four Third Prizes of Ten Shillings each, eight Fourth Prizes of Five Shillings each, and fifteen Prizes, each consisting of a beautifully bound volume of the RAILWAY MAGAZINE, for the best letters giving readers' opinions of the February number. No rules are laid down as to the form the letter is to take, but sound criticism, suggestions and commonsense will be esteemed rather than literary merit. The Editor simply desires the opinions and ideas of readers concerning the February RAILWAY MAGAZINE, set out in simple form. Letters must not exceed six hundred words in length. They must be addressed to the Editor, RAILWAY MAGAZINE, 30, Fetter Lane, Fleet Street, London, E.C., endorsed "Letter Competition" on the outside of the envelope, and reach him on or before 19th February, 1914. No coupons are necessary.

* * *

The Possibilities of a Tourist Ticket.

IT is doubtful whether the possibilities of the specially-routed tourist ticket are as generally realised as they should be. For straightforward journeys they are, of course, well understood; and many readers have, no doubt, utilised the break of journey and alternative route facilities afforded thereby to considerable advantage. In fact, they afford an ideal means of making an extended tour, whether scenic and historic interest or the desire to explore a railway route provide the reason for travelling; and many of the tourist fares offered by railway companies, individually or in co-operation, are designed to meet the wishes of travellers. In many cases, moreover, tourist tickets can be routed specially —indeed the tourist programmes issued by the leading railways usually provide a good assortment of alternatives—and the result is "Plenty for money." An instance is cited by a reader as afforded by a tourist ticket (third class) from Birmingham to Paignton (Devon) and back, fare 30s. 6d. His use thereof may be described in his own words:—"Having arranged my programme, I had the ticket routed *vid* Paddington, Reading, Devizes, Trowbridge, Bath, Bristol, and Exeter, as set forth in the Great Western Railway Tourist Programme as one of the thirteen different alternative routes. I was thus enabled to visit London, Reading, Frome (by paying a few pence excess fare from Trowbridge, not being allowed to break the journey at Frome), Bristol, Taunton, Newton Abbot, and Exeter on the outward journey, and Reading and London again on the return journey, and there are no less than 29 other places which I could have visited had I had the need or inclination. I thus travelled 335½ miles, made up as follows: Birmingham to London *vid* Bicester, 110¼ miles; London to Reading, 36 miles; Reading to Trowbridge, 61¼; Trowbridge to Bristol, 24½; Bristol to Paignton, 103¼. On the return journey I travelled 3¼ miles less than this by returning direct from Bristol to Reading instead of *vid* Trowbridge. This means a journey of 668¼ miles for 30s. 6d., or slightly under 1·83 miles for a penny, which is remarkably cheap when it is remembered that any train, even the 'Cornish Riviera Express,' may be used. It is also noticeable that had I taken an ordinary return ticket for 32s. 3d. I should have been obliged to travel direct *vid* Stratford-on-Avon, Cheltenham, and Bristol, with very restricted regulations as to break of journey. Can any other reader of the RAILWAY MAGAZINE furnish an example of equal generosity on the part of the Great Western or any other company, excluding excursion tickets and cases where fares are lowered to meet competition?"

* * *

A Fireproof Train on the Lancashire and Yorkshire Railway.

A NEW vestibuled centre corridor train was recently brought into service on the 5 p.m. express from Manchester (Victoria) to Southport (Chapel Street), returning from the latter place for Manchester at 8.10 a.m. on weekdays. This train has every modern comfort in railway travelling, and well maintains the character associated with the Lancashire and Yorkshire Railway Company in respect of efficient provision for business and pleasure traffic. The train is composed of eight bogie carriages, with a total length of 471 ft. over all, and has accommodation for 152 first-class and 228 third-class passengers, with luggage vans at each end. The central aisle allows passengers to proceed throughout the train, the carriages being coupled by vestibuled gangways. The coaches are provided with eliptical roofs; large side windows; incandescent inverted double mantle lamps in the first-class compartments and single mantle lamps in the third-class compartments. Lavatories with hot and cold water supplies are fitted in both first and third class vehicles, and special attention has been given to the efficiency of the heating and ventilating system.

The recent reports of Major Pringle with regard to the accidents at Hawes Junction and Ais Gill have received every attention and consideration by the Lancashire and Yorkshire

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Railway, and it speaks well for this company that no time has been lost in taking all possible precautions against risk of accident or fire on their trains. Some of the special features embodied in the new train are:—

(1) All outside panels of the train instead of being made in wood are now of steel.

(2) The carriage floor, in addition to being double and insulated, is covered on the underside with fireproof material.

(3) Salvage tools and extincteurs are carried in each guards' van.

(4) The underframe and bogies are entirely of steel.

(5) The gas reservoirs carried on the underframes are separated from the floor by coverings of steel plates, and are also protected at the ends by steel plates to prevent any possibility of damage.

(6) Each gas reservoir is fitted with an automatic valve, and if the gas pipes are broken, this valve closes and instantly prevents the escape of gas.

(7) Emergency windows are fitted near the centre of each car, if required, for the egress of passengers.

* * *

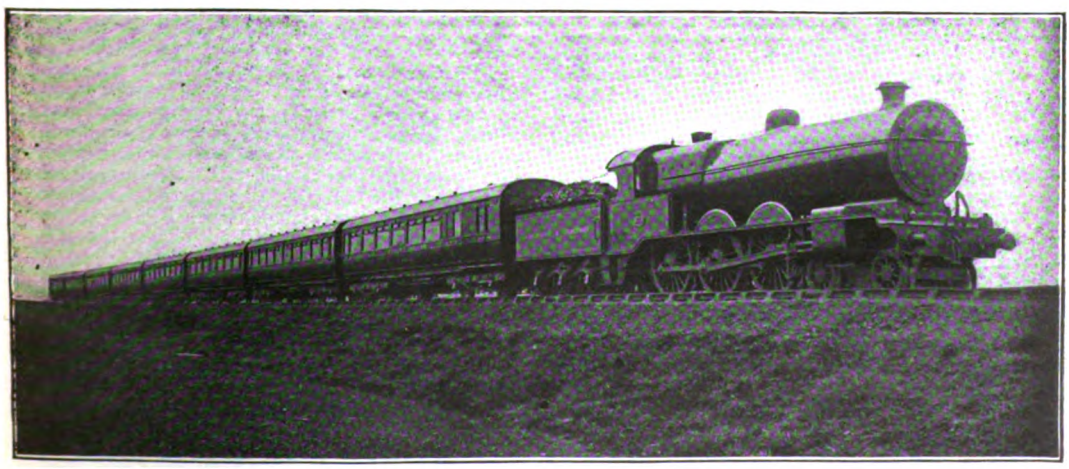
How Railway Freight Rates have Risen.

PARTICULARS have been sent to us showing that while conditions have, unfortunately, necessitated the raising of certain railway rates in this country, the same has also occurred on various foreign railways, and the following notes will therefore be of interest. In the "*Revue Politique et Parlementaire*" for August, 1913, Mons. Colson, the distinguished French economist, himself a government official, shows reason to think that the French railways will need ere long to be permitted to raise their rates, and points out that, with the exception of Germany, in almost every country in Europe rates have recently been increased, in some cases to a considerable degree. In Italy there have been increases in passenger fares that have produced 3 per cent. additional passenger revenue, and increased terminal charges on freight adding 1 per cent. to the freight revenue. In Switzerland the price of "system passes," a very general means of travel in that country, has been raised by from 9 per cent. to 12·5 per cent. Belgium has made various small increases, among them an additional charge of 10 cents per ton on short distance coal. In Denmark a new tariff was introduced in December, 1911, implying an average advance of 9 per cent. over the old rates. In Russia there has been some increase in passenger fares and a marked increase in the rates for a large number of manufactured articles. In Austria some years ago the Government considerably increased the charges for terminal services; in 1910 it raised both passenger fares and goods rates. But as the expected results were not realised, in 1911 and 1912 further important advances were made in the tariffs on cement, lumber, alcohol, petroleum, coal, sugar, and also on general merchandise in carloads. In Hungary there have been large advances. In 1910 and 1911 they made considerable increases in freight rates. The results were satisfactory, but insufficient, and, accordingly, from March, 1912, there have been all-round advances of 5 per cent. and 7 per cent. on express rates and of 5 per cent. on freight rates. In passenger fares there have been even more radical changes. Since July 1, 1912, a new system of fares has been introduced calculated to produce an advance of 18 per cent. over the old revenue. In the United States, also, there is a strong agitation to legalise similar advances.

* * *

A Remarkable Record in Railway Journalism.

FIFTY years ago our weekly contemporary, the *Railway News*, was commenced jointly by the late Dr. Smiles, one-time secretary to the South Eastern Railway Company and well known as the author of the Lives of George and Robert Stephenson, Watt, Telford, and other great engineers, and by the late Mr. Edward McDermott. Since then publication has been continuous, and in celebration of such a record a remarkable "Jubilee" number has been issued by the present management. Printed on art paper, with nearly 700 pages and more than 750 illustrations, a few in colours, and in view of the large size of the pages (corresponding with the



NEW FIREPROOF TRAIN FOR MANCHESTER–SOUTHPORT SERVICES: LANCASHIRE AND YORKSHIRE RAILWAY.

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MR. J. PIKE.
Assistant Goods Manager,
London and North Western Railway.

ordinary issues) this volume is well worth the price of 5/- at which it is sold. Moreover, the authoritative character of the articles also gives them special value. To many are appended names which rank highly in the official and financial railway world, including Chairmen of Railway Companies, General Managers and chief officers of principal lines.

Of the 94 articles included in the main section of the volume, nearly all are signed by gentlemen particularly qualified to deal with their respective subjects, applying to railways in all parts of the world in which British engineers and financiers are interested, as well as the home and colonial systems. In the engineering section, Mr. J. F. Gairns presents reviews of "Fifty Years of Railway Engineering" and "Fifty Years of Locomotive Engineering," while other articles deal with electric traction, internal combustion locomotives, rolling stock, signalling, superheating, and numerous special subjects associated with railway and locomotive engineering. To indicate the manner in which these subjects are covered we may mention that nearly 120 locomotive illustrations are included, apart from those relating to other aspects of railway practice. Our contemporary is to be congratulated upon its long record of active life and also in respect of the notable "Jubilee" number now presented to the railway public.

Official Changes on the London and North Western Railway.

SEVERAL of these have already been referred to; but further reference is called for. Mr. F. T. Kinsman, chief outdoor goods manager of the London and North Western Railway, has retired after 45 years' service with the company, and is succeeded by Mr. Cumberland Lowndes, while Mr. W. L. Jepson, Assistant Goods Manager, has been appointed assistant to the General Manager, for Parliamentary and other duties. Mr. J. Pike has succeeded Mr. Jepson as Assistant Goods Manager. Mr. Pike entered the service of the London and North Western Railway in 1884, in the mineral department. After some years in that division he was transferred to the outdoor goods manager's office, and subsequently to the superintendent of the Line's department. In 1902 he became personal attendant to Mr. W. L. Jepson, then Mineral Traffic Manager, and in 1909 he was appointed chief clerk to the General Manager, Sir Frank Ree. Mr. L. Speakman has been appointed District Goods Manager at Birmingham, in place of Mr. J. G. Humphreys, retired; and Mr. T. H. Shipley follows Mr. Speakman as District Goods Manager at Wolverhampton.

* * *

Railway Reminiscences.

A LETTER from an old-standing reader, Rev. H. C. Courtney, includes interesting reminiscences suggested by Mr. Rake's articles on the Lancaster and Carlisle Railway and references to locomotives of the Crampton type. "When I was a boy at school at Rugby, in 1852," writes Mr. Courtney, "I remember a Crampton locomotive used sometimes to haul the trains from Rugby to Birmingham, and a 2-2-2 with outside cylinders, and the name on a brass plate on the splasher, hauled the trains on the Trent Valley line to Stafford, while the branch from Rugby to Leamington was worked by an old 4-wheeled Bury 'Copper-Nob.' In those days the Midland had their terminus at Rugby. They held to the iron wheels on carriages invented by my grandfather, called, after him, 'Losh' wheels—these very wheels being still used on very many goods wagons—long after most other lines had taken to Mansell wheels. I also remember, very well, seeing the Lancaster and Carlisle Railway made, when I lived in the neighbourhood of Penrith."

* * *

Train Lighting by Electricity.

OUR reference to this subject in the January RAILWAY MAGAZINE was professedly based upon Major Pringle's report to the Board of Trade in respect of the Ais Gill accident, and the tables appended thereto. These did not, however, cover all the railways in the United Kingdom, and we are asked to state that the whole of the passenger rolling stock of the North Staffordshire Railway is fitted with electric light, and has been for some years.

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TRAVELLING facilities in London have undergone great developments during the last twenty years, and those afforded by the Underground have been amongst the most noteworthy. A still further step to simplify morning travel has been taken. A complete system of workmen's cheap return fares came into operation on New Year's Day on the London Electric Railways (comprising the Bakerloo, Piccadily and Hampstead lines), Central London, and the City and South London Railways, and it is possible (subject to certain conditions) up to 8 a.m. on all lines except the Central London (from which tickets are not issued after 7.30 a.m.) for a workman to take a cheap through ticket from any station to any other station on the systems mentioned which will be available for return at any time on the day of issue. No through return fares from station to station are more than 5d., the majority being 2d. and 3d. As an example of cheapness in the new rate of travelling, a workman living at, say, Golders Green and working at Clapham Common or *vice versa* can now travel between these stations *vid* Euston (or Charing Cross and Elephant and Castle) for 4d. return, whereas the combined single fare for this single journey ordinarily is 5d. The workman's return ticket between Wood Lane and Finsbury Park costs 4d., as compared with the ordinary single fare of 5d.; the fare between the Bank and Highgate is 3d. for either the workmen's return or the ordinary single journey. As shown, many of the workmen's new return fares are exceptionally low, and should prove of special benefit to the artisan classes. An illustrated booklet giving all fares and explaining the system can be obtained free from the Publicity Department, Electric Railway House, Broadway, Westminster, S.W.

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IMPORTANT reductions in the ordinary fares have been made between stations on the Great Northern and City section of the Metropolitan Railway. Monthly season tickets at very low rates are in operation and should prove of benefit to the many city workers living in the residential districts served by Highbury, Drayton Park and Finsbury Park, the charges being fixed at very low rates. The Metropolitan Company are rapidly carrying out their reorganisation of the Great Northern and City line, and it is evident that this section is to be brought up to the well-known Metropolitan standard within a very short period. Monthly season tickets on the Metropolitan Railway are now issued at all stations on the Hammersmith line to stations on the Inner Circle as far as Aldgate, as well as to stations on the East London and Great Northern and City sections of the Metropolitan Railway. Monthly rate from Hammersmith to Edgware Road is 10s., to King's Cross, Farringdon Street, Moorgate Street or Liverpool Street is 11s. and to Aldgate 13s. Rates between the other stations on the Hammersmith line, viz., Shepherd's Bush, Wood Lane, Latimer Road, Notting Hill and Westbourne Park, are equally low.

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IMPORTANT additions and accelerations to its services between the London western suburbs and the city have been introduced on the District Railway. The Putney Bridge and High Street, and Wimbledon and Richmond lines in particular are affected, but among other noteworthy augmentations are the following: A through train leaves the Mansion House at 7.21 a.m. for South Harrow; the 9.30 p.m. from Uxbridge to Acton Town has since January 5th run to Hammersmith and become "non-stop" from Ealing Common. The 10.26 a.m. from Ealing Common to Uxbridge will in future start from Hammersmith, leaving that station at 10.18 a.m. and making its first stop at Ealing Common. The widening works at Earl's Court, which have been in progress for some months past, are now practically completed, and a general speeding-up of the services east and west will result. On January 1st a new scale of reduced fares and season ticket rates came into operation on the Wimbledon and Richmond lines. The reductions affect both third and first-class fares. Among others, the third-class single fare from Ealing Common to Wimbledon has been reduced to 7d., and the first-class fare from Ealing Broadway to East Putney is now 9d. single and 1s. 2d. return.

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PASSENGERS on the Great Western Railway are now able to insure their baggage with the Travellers' Baggage Insurance Association. This insurance is effected by the purchase of a ticket obtainable at the booking offices at the principal Great Western stations. The luggage may be insured for amounts of £20, £40, £60, or £100, and for periods of 15, 30, or 60 days. Thus for 1s. a passenger can purchase a ticket which insures his baggage for a period of 15 days for £20, covering, with certain restrictions, all risk of accident by sea or land travel, also whilst staying at hotels and under all situations, including the risk of fire, theft, pilferage, seawater damage, etc., whilst travelling or staying anywhere in Great Britain and Ireland. No declaration is required on issue.

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AN extensive system of lighting by gas has been adopted by the North British Railway at South Leith and Portobello goods yards. In the South Leith yard there are 100 lamps, all 22 ft. above the rail level, wind and rain

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proof, and complete with automatic distance lighters. The installation is on the Pintsch system of inverted gas lamps, and it is complete and self-contained throughout. There are two rotary Pintsch compressors, each capable of dealing with 2,400 cu. ft. an hour. Each compressor is sufficient for 65,000 c.p. at full load, the pressure being 60 in. There are 40 lamps, each giving 750 c.p. with a consumption of only 13·02 cu. ft. an hour, and a large number of lamps of 200 c.p. using only 3 cu. ft. an hour. At Portobello the scheme is on a smaller scale than that at Leith. The plant consists of one Pintsch rotary compressor capable of dealing with 2,400 cu. ft. of gas an hour, and there are 21 1,000 c.p. lamps. In both cases the compressors are driven by gas-engines.

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AN elaborate pamphlet, edited by Mr. W. Turner Perkins and issued on behalf of The Channel Tunnel Company, Limited, contains a series of special articles contributed by Rt. Hon. Lord Sydenham, Mons. Albert Sartiaux, the late General Sir William Butler, G.C.B., Major-General Sir Alfred E. Turner, K.C.B., Lt.-Col. Alsager Pollock, and Commander E. Hamilton Currey, R.N. Full details are given of the present scheme—military, engineering and financial, while particulars are also included of proceedings in reference to the Channel Tunnel in the House of Commons, opinions of the press, consideration of the question of food supplies in time of war, with the late Sir Robert Giffen's evidence on the "Benefit of the Channel Tunnel to British Trade." We learn that an important meeting, convened by the members of the House of Commons who are favourable to the Channel Tunnel, will be held at Cannon Street Hotel on Thursday, 26th February.

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A PORTION of the new Great Western goods station, at Moor Street, Birmingham, is nearing completion. A large portion of the ferro-concrete structure on the Moor Street side, level with the passenger station, has been covered with a steel-framed goods shed 420 ft. by 80 ft. having a platform running its whole length, with sidings to accommodate about 50 wagons. It is anticipated that the portion between Moor Street and Allison Street will be ready for use very shortly this year. The relief lines on the widened viaduct between Bordesley and Moor Street stations are being laid and, with the exception of the special goods line, are expected to be in working order next month. A new signal-box with 107 levers has been erected near Moor Street station.

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AMONG the proposals to be considered by the forthcoming Session of Parliament is the application by the Metropolitan and Great Northern Railway Companies for leave to introduce a Bill empowering the two Companies to incorporate a Joint Committee of Direction for the purpose of making and constructing a number of new lines within the London area. Of these there are altogether eight in number, and their main purpose will be to serve as junction lines between existing routes of railway traffic. The work will entail a large expenditure and relates chiefly to the districts of Moorgate Street, Princes Street, Lothbury and Queen Victoria Street. Other extensions will be provided for at Finsbury, Islington, Harrow, etc.

WIDENING the Metropolitan Railway Viaduct near Kilburn-Brondesbury station is a work of considerable engineering importance. The viaduct passes at a high altitude over several streets and thoroughfares, and its extension has entailed the demolition of a large amount of valuable house property. The works, which will shortly be completed, have been occasioned by the widenings and improvements now in progress on the Baker Street-Harrow section, and which, when finished, will allow of important train service developments between the City and Harrow and northward as far as Aylesbury.

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HEAVY goods trains have always encountered difficulties on the severe gradients of the Somerset and Dorset Joint Railway, particularly through Midford Tunnel and on single line sections, and in order to provide requisite power a series of large 2–8–0 engines are being built at the Derby Works of the Midland Railway. They will have Schmidt superheaters; cylinders, 21 in. diameter and 28 in. stroke; coupled wheels, 4 ft. 7½ in. diameter; leading wheels, 3 ft. 3½ in. diameter; steam pressure, 190 lbs. per sq. in.; heating surface, 1,681 sq. ft.; grate area, 28·4 sq. ft.; weight on coupled wheels, 62 tons; weight of engine in working order, 70 tons 10 cwt.; weight of tender loaded, 45 tons 18 cwt.; total wheelbase, engine and tender, 50 ft. 1 in.; total length over buffers, 59 ft. 9⅛ in. The cylinders and valves will be mechanically lubricated. The engines are expected to be completed during February.

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AN electro-pneumatic power signalling installation has been completed at Bath Road Junction, Slough and is in operation. The new signal box is of brick and built nearer to the junction than the old mechanical cabin. In length the locking frame is 5 ft. 6 in., and in width, 4 ft. 8 in., it contains 17 working levers and six spaces. The plant has been installed by the McKenzie Holland and Westinghouse Power Signal Company, Limited, under the direction of Mr. A. T. Blackall, Signal Engineer, Great Western Railway. When the Bath Road Junction box is switched out, the traffic is controlled from Slough Middle Box.

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TO advertise the new scheme for workmen's return through fares which has recently been inaugurated on all lines of the London Underground, except the District Railway, a poster has been executed by Mr. Gerald Spencer Pryse. The picture shows a number of workers entering an Underground station and is a most striking production. It is likewise remarkable that the artist drew it direct on to the stone. In connection with advertising the new workmen's fares a booklet has been prepared showing all the rates where through fares are in operation.

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MR. RUMBOLT, engineer to the proposed Torrington to Halwell Railway, North Devon, has announced that his firm have practically found the money for the construction. They will make the railway first, and then offer shares to the public. Work will be begun in the spring, and the line will be completed in from eighteen months to two years.

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THE Board of Trade have recently confirmed the undermentioned Order made by the Light Railway Commissioners:—London and North Western Railway (Wolverhampton and Cannock Chase Light Railway) Transfer and Amendment Order, 1913, authorising the transfer to the London and North Western Railway Company of the powers, etc., conferred on the Wolverhampton and Cannock Chase Railway Company by the Wolverhampton and Cannock Chase Railway Acts of 1901 and of 1903 and by the Wolverhampton and Cannock Chase Railway (Light Railway) Orders of 1907 and of 1910, and extending the time limited for the completion of part of the railways thereby authorised, and authorising the London and North Western Railway to abandon other parts of such railways and to construct new light railways in substitution therefor, and for other purposes.

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FROM the Secretaryship of the Irish Railway Clearing House Mr. Chas. Smith retired on the 31st December, after fifty years' railway service. Mr. Joseph Ingram was appointed by the Committee to succeed him. Mr. Ingram entered on his duties on the 1st January. Mr. Ingram entered the Irish Railway Clearing House in 1889 as a junior clerk, and passed through the routine work with satisfaction to his seniors. When the Vice-Regal Commission on Irish Railways was appointed in 1906, and the Irish railway companies selected Mr. Joseph Tatlow to prepare their case and to give general evidence on their behalf, Mr. Ingram was chosen as one of his assistants, and remained at that work for almost three years, gaining an insight into railway working which it would be impossible to obtain in ordinary circumstances. His services were recognised and appreciated, and on returning to the Irish Clearing House he was promoted to be chief clerk in the Secretarial Department, in which position he remained until his appointment as Secretary of the House.

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AMONG the rising generation of RAILWAY MAGAZINE readers there will be many glad to know that Mr. L. Billinton, the locomotive engineer to the London, Brighton and South Coast Railway, says the company is always on the look-out for bright young fellows, and if the directors can get hold of those who have had a good technical education the benefit would be mutual. This remark was made in connection with an announcement that the directors have decided, at the end of the winter session of the Brighton Technical College, to refund fees direct to all their employees who, as students, make 75 per cent. of the possible attendances and sit for a college or external examination. The directors are also offering prizes up to £37 per annum for college work, and have arranged that apprentices with the best records shall be given special opportunities of obtaining experience in various shops, and thus get the privileges of pupilship. This offer, Mr. Billinton says, is equivalent to £150 a year, because the boy, who is given the advantages of a pupil, will, instead of becoming an artisan, go through every branch and become a fully qualified railway engineer. The company receive a very small percentage of boys whose parents pay a large premium for the increased advantages of becoming a pupil.

MR. JOSEPH INGRAM.
Secretary: Irish Railway Clearing House.

A RECENT notable retirement from the service of the North Eastern Railway was that of Mr. John T. Oliver, chief assistant engineer at Newcastle-on-Tyne. He began his railway career in 1857 under the late Mr. T. E. Harrison. The engineering office, in which Mr. Oliver has passed his long period of service, has during his time dealt with such developments as the Consett branch, the Pontop and South Shields railway, the Durham coast railway from Sunderland to Hartlepool, the Alnwick and Cornhill branch, the Riverside line from Byker to Percy Main, the Team Valley branch, and the line from Monkwearmouth to Sunderland, which necessitated the building of the bridge over the Wear, the making of tunnels under the park, and the junction at Ryhope, a big undertaking that cost nearly half a million. During the past fifty years the County of Durham has been interlaced with railways which have led to the opening out of this great coalfield.

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MR. HAROLD DIGGLE has resigned his position with the Lancashire and Yorkshire Railway after 22 years' service, the last 15 years being with the Carriage and Wagon Department at Newton Heath, and joined the well-known firm, Joseph Kaye and Sons, Ltd., of Leeds and London, makers of the patent railway carriage door locks, which are so largely used by British railways.

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A SUM of £10,000 has been distributed among the staff of the Great Northern Railway of Ireland, in recognition of their services in connection with increased traffic during the year. A large proportion of the Dublin traffic has been diverted to the line owing to the disastrous strike which has paralysed the trade of the capital city, and the year has been an exceptional one in all ways for the Great Northern Company.

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We have to congratulate Sir A. Kaye Butterworth, General Manager since March, 1906 of the North Eastern Railway, upon the honour of knighthood conferred upon him by His Majesty. Mr. Henry Holmes, well known as Superintendent of the Line, London and South Western Railway since January, 1902, has also been honoured by appointment as a member of the Royal Victorian Order.

* * *

Mr. J. Warriner, Outdoor Goods Manager, Midland Railway, has retired, after completing more than fifty years' service. Mr. A. J. Owen, Superintendent of Operation, Midland Railway, has been appointed General Manager and Superintendent of the San Paulo Railway, Brazil.

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Mr. W. D. Phillipps, General Manager of the North Staffordshire Railway, has accepted the Chairmanship for 1914 of the Board of Management of the Railway Benevolent Institution.

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The Annual Staff Dinner of the Furness Railway Locomotive Department was held on January 20 at the Furness Abbey Hotel, the chair being occupied by Mr. W. F. Pettigrew, Locomotive, Carriage and Wagon Superintendent.

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Speaking at the recent annual staff supper of the Stratford-upon-Avon and Midland Junction Railway, Mr. A. E. Diggins, the secretary and traffic manager, remarked that many improvements had been made on the railway during the past year. New refreshment-rooms had been erected at the Stratford-on-Avon station, and there was a room set apart where ladies could enjoy a cup of tea without being inconvenienced by the atmosphere of a bar. The new urinals at the station were badly needed, and in addition they had erected a new coal shelter for protecting the men in severe weather, and an extra crane had been purchased for dealing with the traffic at the Towcester end of the line, while great attention had been paid to the improvement of the loops. During the past year practically every engine had been thoroughly overhauled, and their carriages and wagons were well maintained. With regard to the permanent way their engineer, Mr. Russell Willmott, would admit that he had never seen it in a better condition. It was hoped during the coming year to build some cottages at Blisworth for the staff. Some of the men lived several miles from their work. Then, again, much had been done for the employés, and in nearly every grade increased pay had been given; in some instances the holidays had been extended, and the hours of labour lessened.

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Mr. Russell Willmott (Manager), at the Isle of Wight Central Railway's annual staff dinner, at Newport, said they had had a record year in the number of visitors to the island, and they thanked the public for their response to the company's cheap fares, which had resulted in their trains carrying 105,000 more people than in 1912. They had not only paid their first dividend, but they had bought the Godshill line, lock, stock and barrel, and the winter service now in force was better than it had been for several years. With the co-operation of the Isle of Wight Railway they had endeavoured to boom the island all over the United Kingdom and on the Continent.

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The Annual General Meeting of the Railway Club, 92, Victoria Street, S.W., was held on Tuesday, January 13, and at its conclusion Mr. M. G. S. Blane, B.A., read a paper on the Light Railways of France. The lecturer outlined the policy of the French Government towards the construction of light railways, and mentioned the various decrees and ordinances governing the construction and operation of the great network of metre and standard guage lines comprised in the system of light railways. Mr. Blane, from his great knowledge of the French railways, gave instances of the groupage, for economic and financial reasons, of the light railways into systems, and very adequately described their relations with the various departmental authorities, and the operation of the lines, their traffic and rolling stock. He touched upon the geographical features of the country and its influence upon the railways as regards their traffic and density of business. The lecture was illustrated by upwards of 100 lantern slides, and a large number of railway postcards. At its conclusion Mr. Blane was warmly thanked for his notable contribution.

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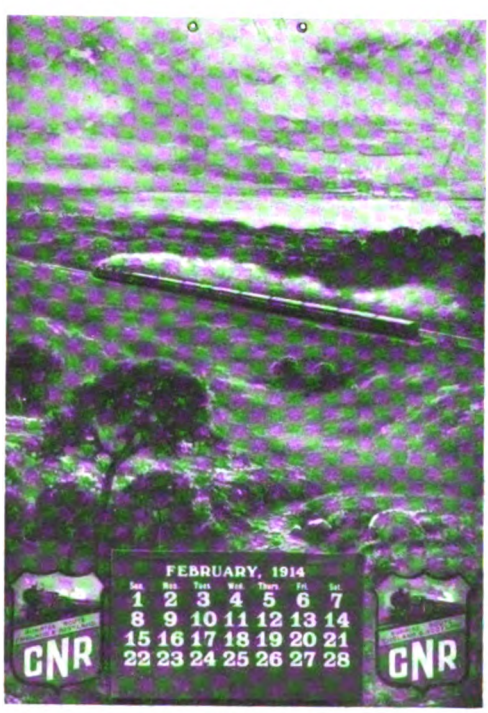
At the Annual General Meeting of the Institution of Locomotive Engineers the Secretary and Treasurer (Mr. G. F. Burtt, 46, Malling Street, Lewes) presented a very favourable report of increasing membership, good progress and a satisfactory financial position. The retiring



AN ATTRACTIVE CALENDAR ISSUED BY THE GREAT NORTHERN RAILWAY.

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President, Mr. H. Fowler, Chief Mechanical Engineer, Midland Railway, announced his award of the first premium to Mr. W. J. Bennett for his paper on "Locomotive Boiler Examination, Defects and Repairs," and of the second to Mr. J. F. Gairns for his paper on "Some Debatable Factors in Locomotive Design and Practice." Following this meeting, Mr. A. J. Hill, Locomotive Superintendent, Great Eastern Railway, President of the Institution for 1914, delivered an address on "Questions affecting the Cost of Repairs and Renewals of Rolling Stock."

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MR. H. G. LEWIN, B.A., formerly District Superintendent, York, and Mineral Train Superintendent, North Eastern Railway, gave the first public lecture of a series of three, on "The British Railway System: Outlines of its Development up to 1844," on Tuesday, January 20, at the London School of Economics and Political Science. Mr. F. H. Dent, General Manager, South Eastern and Chatham Railway, occupied the chair at the first lecture.

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AFTER first fitting five engines with the "Robinson" Superheater, the San Paulo Railway are now equipping five new four-cylinder locomotives being built at the North British Locomotive Company's works. The Great Northern Railway, after giving a trial to the "Robinson" Superheater on six goods engines, made a contract for the fitting of this Superheater to a large number of engines of various types. The Great Eastern Railway have also decided to fit a further number of engines of the "Claud Hamilton" type with the "Robinson" Superheater and other railways which have placed repeat orders are Gold Coast, Buenos Ayres, and Pacific, Manila, Central Argentine, Caledonian, Bengal Nagpur, North Eastern, Ceylon Government, South Eastern and Chatham and Leopoldina (including one rack locomotive). Success attending the fitting of five express engines on the North British Railway has resulted in a further series being fitted, and amongst other orders The Locomotive Superheater Corporation, Ltd., have received are those from the North Western Railway of India, Eastern Bengal State Railway, Queensland Railway, Glasgow and South Western Railway, Egyptian State Railway, Midland Great Western Railway (Ireland), North Eastern Railway, Great Western of Brazil Railway, Central Uruguay Railway, Buenos Ayres Midland Railway, Buenos Ayres Great Southern Railway, Buenos Ayres Western Railway and Great Indian Peninsula Railway.

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A LARGE bridge of Scherzer type for the Great Central Railway is under construction across the Trent River at Keadby. It is a combined double track railway and highway bridge, with a length of movable span, centre to centre of bearings, of 160 feet 6 inches. This bridge is being erected under the charge of Mr. J. B. Ball, engineer-in-chief, the Scherzer Rolling Lift Bridge Company furnishing the detail plans and acting as consulting engineers for the movable portion. The work is expected to be completed during the year and the result will be the largest single leaf movable bridge yet constructed in Great Britain.

A 225-FEET span double leaf bridge of Scherzer type under construction at Pamban Pass on the line of the Indo-Ceylon connection of the South Indian Railway is rapidly nearing completion. This bridge is somewhat similar in outline to the double leaf bridge of similar type completed across the Ngawun River, Burma, and in successful service on the lines of the Burma Railways since 1908. A single leaf bridge of Scherzer type is being constructed by the Burma Railways across Pazundaung Channel at Rangoon. It has a movable span 119 feet long in connection with fixed approach spans, the entire bridge being 769 feet long. The bridge was designed by Messrs. Rendel, Tritton and Palmer, consulting engineers for the Burma Railways, the Scherzer Company furnishing the plans for the movable part of the structure.

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RAILWAY engineers and permanent way officials will be interested to know that The Railway Track Supply Co. (of Great Britain), 81, Gracechurch Street, London, E.C., have now placed on the market a patent rail anchor for use with bull-headed rails, which is known as the "R.T.S." Rail Anchor. Tests already made with this device prove that it will eliminate rail creep on bull-headed track. Prices and particulars can be obtained from The Railway Track Supply Co., who will also be pleased to supply a few samples free of charge for trial purposes. RAILWAY MAGAZINE readers are no doubt aware this Company are the sole manufacturers of the Vaughan Rail Anchor for flanged rails.

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THE Paris, Lyons and Mediterranean Railway are publishing the second and third sections of an atlas of their system. They embrace respectively Savoy and Dauphiny and the Riviera, and contain a good map of the district, also many black and white illustrations. Two splendid pictures are reproduced in colours in each section: "The Army of Bonaparte crossing the Alps in 1800" and "The Alpine Rifles during the Manœuvres (1913)" in the first one, and "The Carnival of Nice" and "Battle of Flowers in the Bay of Villefranche" in the other. RAILWAY MAGAZINE readers can obtain either section free on application to the Paris, Lyons and Mediterranean Railway offices (Dept. Atlas), 179, Piccadilly, London, W.

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A NEW solid steel lunch counter car has been placed in service between New York and Philadelphia, on trains which also carry ordinary dining cars. The object in building the counter car was to see if it would permit of serving meals to passengers quicker than is possible in a dining car. The new vehicle is eighty feet long, and the exterior appearance is the same as that of a Pennsylvania all-steel passenger coach. The interior is radically different from the ordinary dining car. Instead of tables there is one long mahogany counter extending over half the length of the car; facing this counter on one side are revolving mahogany chairs, secured to the floor. The counter is long enough for 21 people to be seated at one time. Back of the counter against the wall there are twenty cupboards for supplies, in addition to receptacles for crushed ice, drinking water, ice cream, milk and cream. Shelves for linen and silver occupy the space under the counter. Sunk

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in the counter at the end away from the kitchen is a cigar humidor. At one end of the car there is a wash basin for the use of passengers. Pantry and kitchen are at one end of the counter. Food is passed from the kitchen into the pantry through openings which can be closed by sliding doors. As these openings are just above the serving table in the pantry, there is no necessity for waiters to go into the kitchen. The car represents apparently an extension of the buffet car system first brought into use in England by the Great Central Railway.

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FEW people in the British Isles are aware of the marked advances made within recent years in Canadian Hotel accommodation, and that the usual optimism allied with any movements in this new country are particularly surpassed in this line. This feature is most striking in the new Grand Trunk Railway Hotel "Chateau Laurier," at Ottawa, Ontario, a city of 100,000 inhabitants, and being followed by this company in their new hostelries at Winnipeg, Edmonton, Regina, Prince Rupert, and Canadian Rocky Mountain resorts. The following remarks made recently by a prominent Washington, U.S.A. representative, certainly reflect on this Canadian accommodation and the British enterprise at the back of it:—"Permit me to speak my sincere appreciation of the 'Chateau Laurier.' I did not think that Canada would ever have an hotel of this class, but I now feel as if you had not only the finest hotel in Canada but almost on the Continent. We certainly have nothing, even in Washington, that can compare with it."

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ONE of the happiest indications of the development of Australia's primary industries and the extension of settlement is the fact that increased railways and additional railway rolling stock are necessary to cope with the demands of the settlers. In New South Wales, for instance, commencing January this year, new locomotives for the railways will be received at the rate of eleven per month from England. Four per month will be made at the Government workshops in New South Wales. For imported engines the Government will pay at the rate of £55,000 per month, and for those locally produced £30,000 per month. In addition, there will be £30,000 per month spent on rolling stock, and £100,000 for duplication. On railway material, in this way, £205,000 per month, or £2,460,000 for the year, will be spent. There is urgent need for this increased plant to handle the increasing harvests.

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JAMES CHARLTON, Chairman of the Trans-Continental Passenger Association, died recently of paralysis, at his Chicago home aged 81 years. Mr. Charlton had been associated with railway work in the United States after leaving Canada in 1870. He was born in Northumberland, May 15, 1832, and began his railway career in 1847 as junior clerk for the Newcastle and Carlisle Railway. Having risen to the position of chief clerk, he resigned in 1857 to become assistant to the chief clerk of the Great Western Railway of Canada. In 1870, when he was General Passenger Agent of this railway, Mr. Charlton again changed and became General Passenger and Ticket Agent of the Northern Missouri Railroad. A few months later he accepted a similar office with the Chicago and Alton Railroad, and held it until 1900, when he became Chairman of the Trans-Continental Passenger Association.

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AT the International Exhibition for safety appliances held in New York, the E. H. Harriman Memorial Medal was awarded to the Southern Pacific Railroad. The medal is offered from year to year by Mrs. E. H. Harriman to the American railroad showing the best results in the safe operation of their services. A facsimile of the medal was presented to Mr. Kruttschnitt, Chairman of the Southern Pacific Board of Directors. In making the presentation it was remarked that not a single passenger had met his death on the lines of the Southern Pacific during the last five years. The Southern Pacific was represented at the Exhibition by numerous models of safety appliances and descriptive literature demonstrating that they have hitherto expended no less than $12,000,000 for automatic block signals, abolition of level crossings, automatic couplings and similar devices tending to secure the safety of operation. At the same time $10,000,000 were spent for steel passenger carriages, of which this railroad will possess 900 upon completion of current contracts, only 1,500 wooden coaches being then in use, principally on branch lines with restricted traffic.

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WITHIN a few months Prince Rupert, B.C., the Pacific Coast terminus of the Grand Trunk Pacific Railway, will have its first permanent hotel building. This will be the "Premier," now being completed as quickly as possible. The first modern fire-proof, brick, steel and concrete hotel erected north of Vancouver, in either Canadian or American territory, it has a frontage of 50 feet on Second Avenue and 100 feet on Sixth Street, and overlooks the Grand Trunk Pacific reserve, which is to be laid out in a park. Five stories high, it contains eighty bedrooms with hot and cold running water in every room, the majority of the rooms being furnished with private baths.

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MR. CHARLES CORNER, M.Inst.C.E. M.Am.C.E., Chief Engineer Beira and Mashonaland and Rhodesia Railways, Bulawayo, commenced extended leave at the end of November, 1913, prior to retirement, after 15 years' service. During this period Mr. Corner acted as General Manager in 1909 and again in 1913.

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Railway Literature.

THE ELEMENTS OF RAILWAY OPERATING ECONOMICS. By C. Travis, D. R. Lamb and J. A. Jenkinson. [Price 2s. 6d. net. The Boswell Printing and Publishing Co., Ltd.]. This volume, consisting largely of articles reprinted from the *Railway News*, is dedicated "to the Railway Student, interested in his profession, its importance, and its vast possibilities"; and has been prepared in view of the demand for a "work which, neither too abstruse nor technical, discusses the railway business in its collective aspect of a producer, distributor, and seller of the commodity of transport." It is designed to propound and discuss the application of economic theory to the railway business from a practical standpoint. Within a range of 220 pages, including fourteen chapters, a bibliography and a comprehensive index, all phases of the subject are discussed, and we may mention the following principal headings:—Passenger traffic, goods and mineral traffic, terminal operation, rates and operation, construction and maintenance of the road, locomotive design and practice, locomotive operation, rolling stock, organisation of operating departments, statistics, rail *versus* road transport, state *versus* private management, etc. Carefully and systematically prepared, this volume may be cordially commended to students of railway matters.

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THE SOUTH AMERICAN YEAR BOOK AND DIRECTORY. The Louis Cassier Co., Ltd., 33, Bedford Street, Strand, W.C. This volume incorporates the *South American Railway Year Book*, the *South American Annual*, and the *South American Blue Book*, and constitutes a veritable encyclopædia of general and special information relating to the ten republics of the South American Continent, together with British, Dutch and French Guiana, the Panama Canal and the Falkland Islands. It is compiled and edited by Mr. C. S. Vesey Brown, M.Inst.C.E., M.I.E.E. There are 44 maps, specially prepared and well designed, with a comprehensive series of illustrations; but the chief value is afforded by the singularly comprehensive articles in Part I., which is devoted to the railways of South America, and the contents of Part II. covering the republics and districts, with sections devoted to the Panama Canal, the Pan-American Union, the Monroe Doctrine, lists of British Diplomatic and Consular officers, banks, shipping services, cable and telegraph companies, distances from ports in South America, Lloyds and other agents, time, newspapers, and a South American bibliography. The mode of presentment, with sectional and paragraph headings, tables, lists of officers, technical details and financial information, is a good one, and is designed to facilitate ready reference. Much information of a general character is associated with that of a technical and detailed nature; and although the volume is a big one, of over 600 pages, the whole of the space is utilised to the best advantage, and we quite anticipate that wherever the *South American Year Book* is adopted it will be in continual use for reference.

* * *

RAILWAY ROMANCE AND OTHER ESSAYS. By James Scott. [Hodder & Stoughton. Price 5s.] Only the first portion of this book is of a railway character, the three other sections dealing with miscellaneous subjects. Professedly concerned with the romantic side of railway working, the ten divisions of Part I. are rather superficial in character; but incidentally many facts and matters of interest are presented. The various railway essays deal with the fascination of the railway, signalling, the locomotive, the locomotive fireman, goods traffic, railway stations, permanent way, "en route for 'The Twelfth,'" an ascent of the Jungfrau, and—somewhat inappropriately—aerial navigation.

* * *

THE LOCOMOTIVE ENGINEER'S POCKET BOOK AND DIARY, 1914. [The Locomotive Publishing Co., Ltd. Price 2s. 6d. net.] Revised to date, and with additional articles in the reference section, this pocket book and diary may be commended. Bound in leather and handy in size it includes a wealth of data for the use of locomotive engineers and readers interested in locomotive practice, with many diagrams, lists of dimensions, tables and much technical and general information.

* * *

THE BALDWIN LOCOMOTIVE WORKS: FORTY THOUSANDTH LOCOMOTIVE. An interesting brochure has been issued by the Baldwin Locomotive Works in view of its unique record. Much of the information contained therein was covered by the special article appearing in the December RAILWAY MAGAZINE; but illustrations and particulars are included of many notable engines built by this well-known firm. The 40,000th locomotive is a big 4–6–2 superheater engine for the Pennsylvania Lines West of Pittsburg.

* * *

LIST OF ANNUAL SUBSCRIPTIONS TO ENGLISH, COLONIAL AND FOREIGN NEWSPAPERS, MAGAZINES, ETC. This useful publication, issued by Messrs. Wm. Dawson & Sons, Ltd., reaches its 25th edition as issued for 1914. Under various headings particulars of the subscription rates of thousands of publications of all kinds are included, these being given geographically and according to subject matter or class. Other information on associated matters is also included.

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THE PREVENTION OF ACCIDENTS ARISING IN CONNECTION WITH THE DOORS OF RAILWAY CARRIAGES. By J. Wilson, The Gabled House, South Church Street, Bakewell, Derbyshire. This booklet is written in order to draw attention to the large number of accidents, many causing loss of life, which occur through no provision being made for safety-fastening the doors of railway carriages; to set out the existing position; to explain the points involved in dealing with the matter; and to describe feasible schemes for locking the doors. Copies of correspondence exchanged between the author and the Board of Trade are included, and after discussing various aspects the writer describes his inventions for solving the problems involved. The subject is carefully considered from all points of view, with acknowledgment of practical aspects, and the author makes out a good case in favour of his schemes, which are designed to meet several conditions of application.

* * *

SOLUTION OF RAILROAD PROBLEMS BY THE SLIDE RULE. By E. R. Cary, C.E., Professor of Railroad Engineering and Geodesy, Rensselaer Polytechnic Institute, Troy, N.Y. [Price 4s. 6d. net.]

THE PRACTICAL RAILWAY SPIRAL. By L. C. Jordan, B.S., C.E., Principal of Civil Engineering Department, Heffley Institute, Brooklyn, N.Y. [Price 6s. net.]

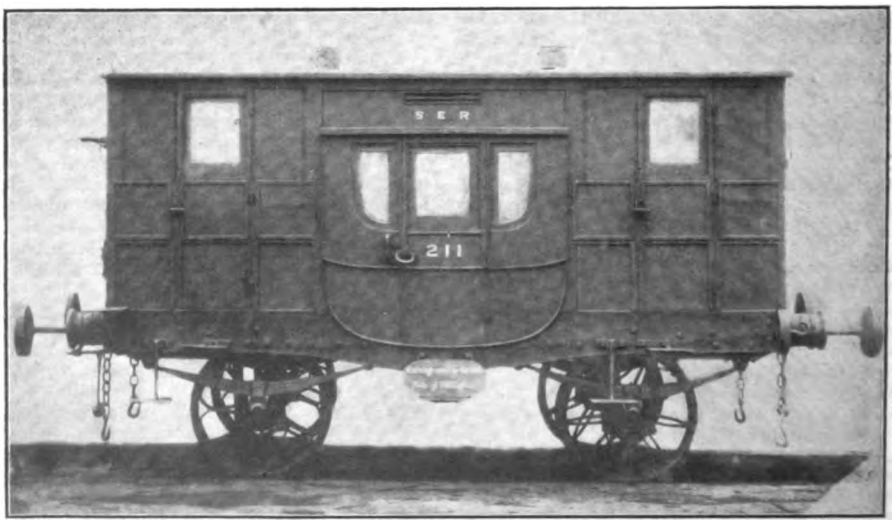
These two volumes, published by Constable and Co., Ltd., are of an essentially practical character, and necessarily will appeal only to those engaged professionally in railway engineering and students interested in the subjects involved. Both are written by American authors, but the subjects will concern practical railway engineers in all countries; and the calculations and tables presented should be of widespread use. The respective authors have endeavoured to produce order out of somewhat "chaotic" practice, and to systemise methods which are often rather more approximate than is altogether desirable.

* * *

THE "PRACTICAL ENGINEER" POCKET BOOKS AND DIARIES FOR 1914. These useful volumes, of convenient pocket size, are designed, one for the use of mechanical and general engineers, the other for electrical engineers. In cloth binding, the price of each is 1s. net; in Peltine binding, 1s. 6d. net. A wide range of practical data and information is given in the 600 or so technical pages included, with diary, pages of checked paper for sketches and other useful features. They can be cordially recommended to our practical and technical readers.

* * *

HANOMAG JOURNAL. Nos. 1, 2 and 3 of a journal now being issued by the Hanover Locomotive Works under this title have been received. Interesting particulars are given of the birth of this firm, in the hands of Georg Egestorff, in 1835, and its growth into the notable industrial establishment of to-day. The first locomotive was built for the Hanover State Railways in 1846. Now between 450 and 500 locomotives can be turned out per annum, while the firm has many other specialities affecting various branches of engineering.



AN HISTORIC RELIC PRESERVED BY THE SOUTH EASTERN RAILWAY.

This carriage was reserved, in the early days of the railway, for the Duke of Wellington, when Warden of the Cinque Ports.

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MIDLAND RAILWAY:
LIVERPOOL AND MANCHESTER RESTAURANT CAR EXPRESS.

Published by "THE RAILWAY MAGAZINE."
Photograph by F. E. Mackay

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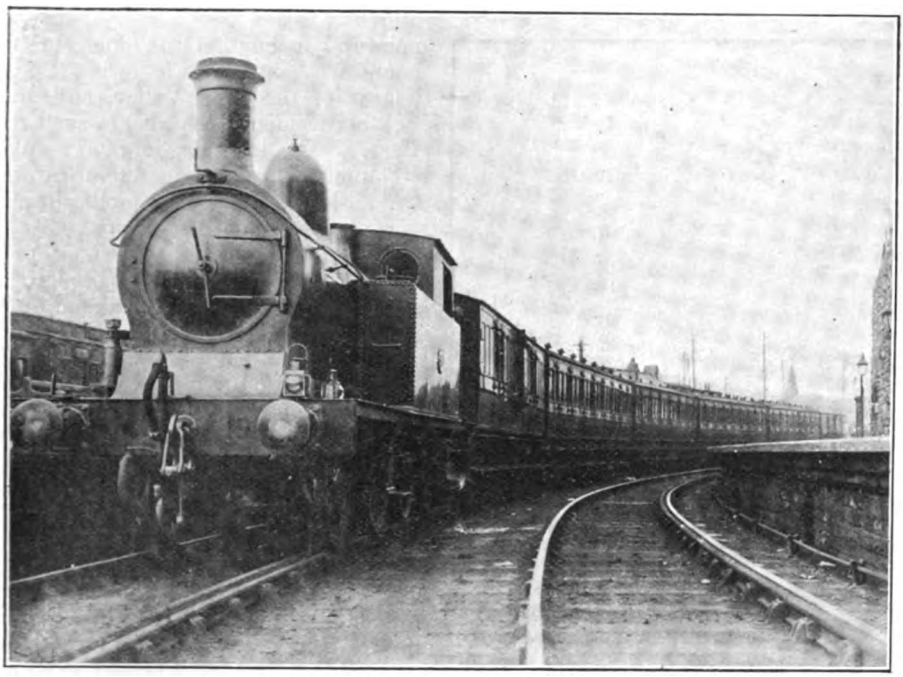

RHONDDA AND SWANSEA BAY PASSENGER TRAIN.

The Rhondda and Swansea Bay Railway.

By ALFRED W. ARTHURTON.

THE early history of the Rhondda and Swansea Bay Railway was characterised by a constant struggle against the opposition of various interests and lack of support from the public, the difficulty in obtaining subscriptions during the earlier years of the venture being in no small measure responsible for the slowness of construction. For some years those interested in the development of the port of Swansea and the natural resources and trade of the district had cast longing eyes at the rich deposits of coal lying to the north-east, but separated from the western seaboard by a high ridge of hills. The opening of the Prince of Wales Dock by King Edward VII (then Prince of Wales), in October 1881, provided accommodation for the reception of steamers of the largest dimensions, and with these greatly increased facilities for coal shipping, it was thought that a portion, at all events, of the mineral wealth of the Rhondda Valley could be diverted to Swansea, which was situated some 40 miles nearer the open sea than its sister port of Cardiff. The only hope of accomplishing this was to build a line which would tap the coalfield at the upper end and convey the coal westward for shipment instead of to the eastern port.

A public meeting was therefore called for the purpose of formulating a scheme to provide direct through rail communication with the Rhondda Valley. This scheme, which was laid before a large gathering at Swansea on November 12th. 1880, was described as being of rich promise to the future prosperity of the port and town and proposed to utilise the Glyncorrwg or South Wales Mineral Railway along its whole length stretching from Glyncorrwg to Neath, by which means the whole line could, it was said, be completed by a tunnel at the upper end into the Rhondda Valley, a deviation to avoid a too steep incline, and a tidal bridge over the river at Neath. The scheme had the merit of directness of route, —straight as the crow flies from Glyncorrwg to Neath River—and by utilising a railway already in existence, the cost could be considerably reduced. Collieries were already connected with the South Wales Mineral

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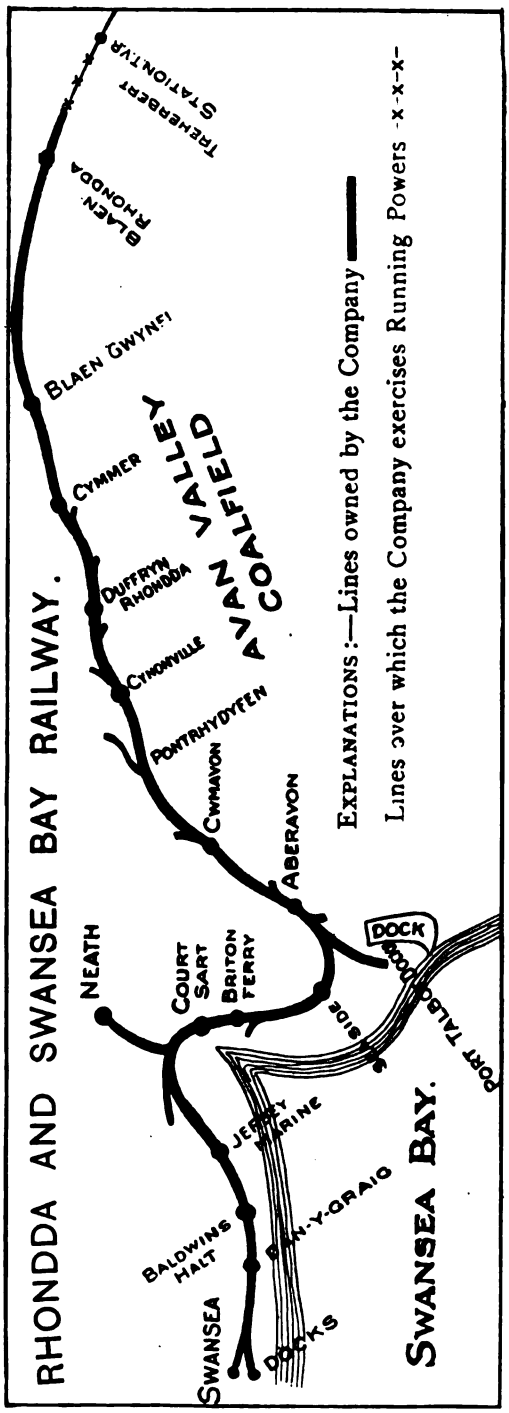

line, and there was a practicable junction with the Llynvi and Ogmore Railway at Cymmer. On the other hand the railways which were thus to be utilised indicated an unnatural inclination to "hug the tops of mountains" instead of following the natural descent of the Afon Valley, and included such old-fashioned expedients as "rope inclines." The meeting, however, appointed a committee to obtain subscriptions and give notice of application for Parliamentary powers to carry out the scheme.

In the same Session, powers were asked for a rival scheme; this proposed to obtain independent access to the Rhondda Valley by a line, which, commencing by a junction with the Taff Vale Railway at Treherbert, crossed the mountain ridge by a tunnel and followed the valley of the Afon in a gradual descent from Cymmer to about Pontrhydyfen, thence by a short cut over Baglan Bay and across the mouth of the Neath River to Swansea. Such a line, had it been authorised, would have brought the Rhondda Valley very near to Swansea, while the additional advantage of having the gradient "with the load" all the way, was also in its favour. It was claimed that train loads of 533 tons could be conveyed by this route as compared with 400 tons by the Glyncorrwg route. The tunnel, however, by which it was proposed to connect the Glyncorrwg and Rhondda Valleys would necessarily have to be near the top of the latter and, as some of the richest coal veins and largest collieries were situated lower down the valley than Treherbert, the coal would first have to be pulled up to the top of the ridge before descending to Neath and Swansea. This was considered of minor importance, however, compared with getting a fresh outlet for the coal at Swansea.

In the proceedings before the Select Committee the opposition of the people of Neath to the proposed bridge across the mouth of their river was successful in preventing the sanctioning of the whole line throughout to Swansea, just as thirty years earlier similar opposition to the South Wales Railway Bill caused the alteration of Brunel's original plans for that line along the coast from Briton Ferry, and was incidentally responsible for placing Swansea "off the main line," which had to make a long detour viâ Neath and Llansamlet. The scheme known as the Rhondda and Swansea Bay Railway was, however, approved in preference to the Glyncorrwg proposal, a compromise with its opponents being effected by assenting to the westward limit of the line being, for the time, the left bank of the river Neath at Briton Ferry. By the same act of 1882 a branch line from Pontrhydyfen at the foot of the

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Afon Valley to Cwmavon, Aberavon and Port Talbort was also authorised.

The result was very encouraging to the promoters of the line, prominent among whom were the Earl of Jersey, Sir John Jones Jenkins, M.P. for Carmarthen Borough (now Lord Glantawe), the late Lord Swansea, Mr. John Richardson Francis, Mr. Morgan Bransby Williams (late chairman of the Company), Mr. Thos. Cory, Mr. C. L. Bath, and Mr. T. D. Daniel (Mayor of Aberavon), all of whom had contributed liberally to the preliminary expenses of the new venture. Mr. Thomas Joseph also, the owner of 2,000 acres of best steam coal in one block in the district to be served by the proposed line, and with his neighbours possessing 4 square miles of coal estimated to be 50 ft. thick, was also a strong supporter of the scheme for forming a direct outlet to Swansea.

In the following Session, powers were sought to extend the line already sanctioned from Briton Ferry to Swansea to form a junction with the Prince of Wales Dock Railway, and crossing the Neath River by a tunnel instead of by the bridge against which, on the previous hearing, the inhabitants of Neath had successfully protested. This tunnel was to be 1490 yards long and to cost £72,000, or about £48 per yard, and a great deal of evidence as to its practicability and otherwise was given before a Select Committee of the House of Lords by eminent engineers of the day. Among these were Mr. Henry Law, C.E. a pupil of Brunel's

MR. JOHN DAVID.
General Manager: Rhondda & Swansea Bay Railway.

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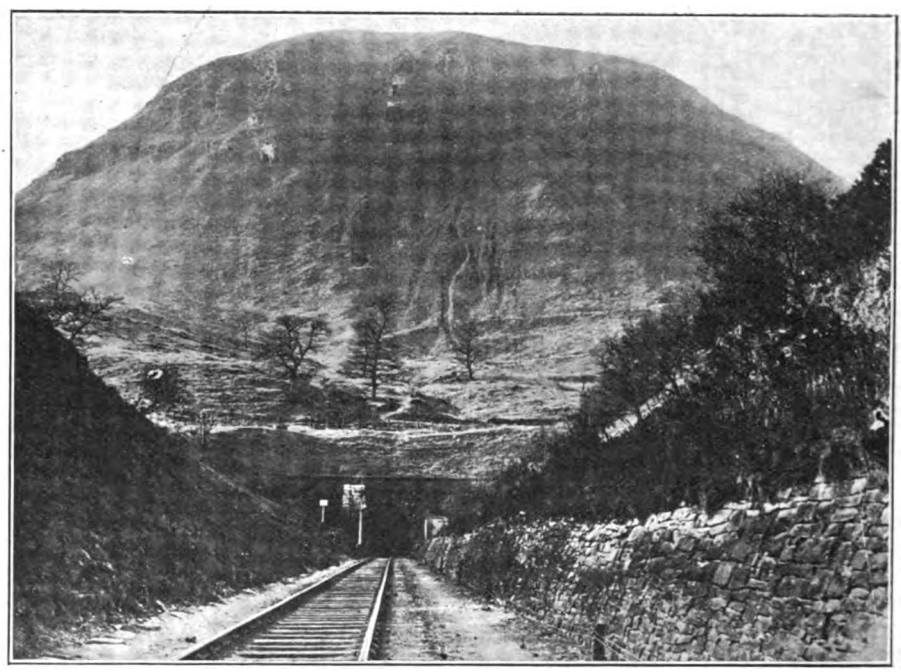
father (Sir Isambard), for whom he had superintended the completion of the Thames Tunnel, and had also laid out the South Dock at Swansea. Sir Joseph Bazalgette, Chief Engineer of the Metropolitian Board of Works, also gave evidence strongly in favor of the tunnel scheme, while Sir Hussey Vivian. Bart. M.P. (afterwards Lord Swansea) submitted valuable and cogent reasons for providing the line as suggested, stating that the Prince of Wales Dock could not hope to reach its full development until there was direct communication with the Rhondda Valley. In opposition to the Bill, expert evidence by Sir John Fowler, Sir Benjamin Baker and other eminent engineers was called, but the Committee by 3 votes to 2 decided that the preamble had been proved. Once more the promoters had obtained their object in the teeth of great opposition, and prophecies that the line would turn out to be a second Taff Vale Railway in the matter of generous dividends were freely made.



ENTRANCE TO TUNNEL, RHONDDA VALLEY END.

The extension to Swansea, however, was not commenced, as an agreement was come to with the Great Western Railway Company to carry the Rhondda and Swansea Bay Co's traffic between Port Talbot and the latter's own line at Swansea. This agreement was sanctioned by the proprietors at the half-yearly meeting of August 1885; and the Swansea extension, as well as the portion between Pontrhydyfen and Briton Ferry, including the Baglan tunnel and the tunnel under the Neath River, which latter had been found difficult of construction owing to the nature of the ground and the enormous cost, were abandoned. Consequent reduction of capital was authorised by an act dated June 4th, 1886. In the previous year an act to extend the period limited for the purchase of land, etc. was obtained. In 1888 powers authorising the construction of important junctions with the Taff Vale Railway at Treherbert and other places were granted, and in 1890 four short lines at Swansea Docks, Aberavon and Port Talbot, with a quay or wharf at Port Talbot and a diversion of road between Aberavon and Cwmavon, were authorised.

A further change of policy took place in 1891, when the agreement of 1885 with the Great Western Company was annulled and the powers granted the Rhondda and Swansea Bay Company to extend their line to Briton Ferry revived. In the following year powers—refused the previous session—were granted to connect the railway at Briton

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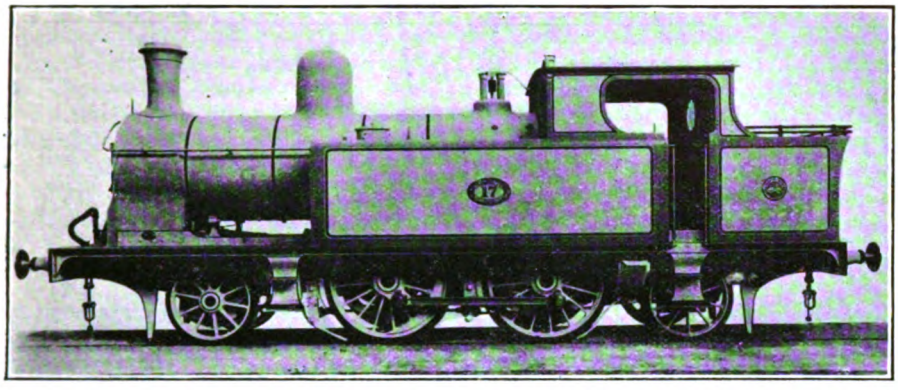
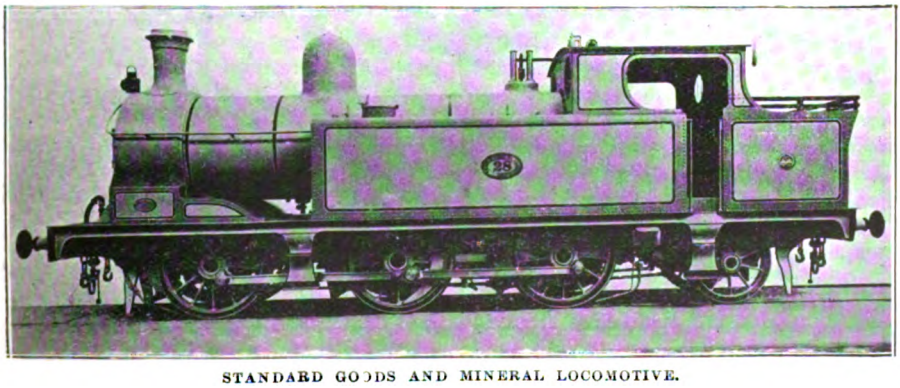


STANDARD PASSENGER LOCOMOTIVE.

Ferry with the existing lines of the Prince of Wales Dock at Swansea by means of a bridge over the Neath River, and for making sundry junction lines. This extension, it was calculated, would take two years to construct, but, as a matter of fact it was not until March 1895 that the whole railway throughout to Swansea was opened for passenger traffic. A further act in June 1893 sanctioned the construction of the line from Aberavon to Briton Ferry in place of that authorised by the act of 1891.

The chief engineering features of the line are the Rhondda Tunnel, between Blaengwynfy and Treherbert, and the Neath River Bridge, both of which deserve special mention. The former, the longest tunnel in Wales, is 3443 yards in length (about 2 chains short of 2 miles) and occupied a little over three years in construction. It is lined for the most part with native stone, but the difficulties of construction were accentuated owing to the borings having to be made from the ends only, the height of the mountain which it pierced prohibiting intermediate shafts being made from which additional headings could be driven. In spite of this, and the fact that the tunnel has a curve at one end, the borings met in the centre with the utmost accuracy, both in level and in alignment, a striking tribute to the ability and care of Mr. Yockney, the engineer. Boring was accomplished by means of machine drills worked by compressed air, the latter being subsequently released in the workings for the purpose of ventilation. The strata consisted in the main of extremely hard rock, for the removal of which large quantities of dynamite were used. At one time upwards of 1,100 men, consisting of navvies, miners, masons etc., were engaged on the work, and it is satisfactory to record that during the whole course of construction there was scarcely an accident of a serious nature. The line through the tunnel was opened for the traffic on July 2nd. 1890.

The Neath River Bridge is a further tribute to the skill of its engineer, Mr. Yockney. It is the only swing bridge in the Kingdom



STANDARD GOODS AND MINERAL LOCOMOTIVE.

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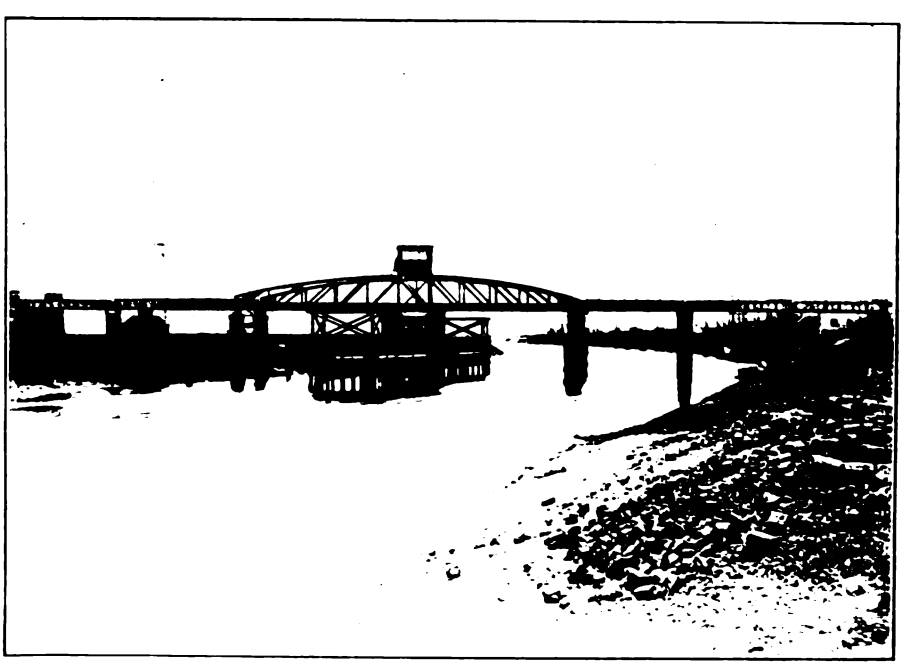
NEATH RIVER BRIDGE, OPEN FOR SHIPPING.



NEATH RIVER BRIDGE, LOOKING TOWARDS THE SEA.

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both on the skew and on a curve and, when first suggested, was derided by many, but its successful completion silenced all such critics. The work of construction was commenced in November 1892. The bridge has a total length of 388 ft., the swing portion being 167-2 ft. long, while the width to the to the centre of girders is 27 ft. There are five fixed spans of 60 ft. each, the whole resting on 6 ft. and 7 ft. steel cylinders sunk 40 ft. in the bed of the river and filled with cement. The total weight of ironwork was 1400 tons and over a quarter of a million rivets were used. The contract for the bridge was let to Messrs. Finch & Co., of Chepstow, for whom Mr. Palmer of Neath performed the work of erection. The hydraulic machinery was supplied by Sir W. G. Armstrong & Co., and the signalling and interlocking plant by Messrs. McKenzie & Holland of Worcester.

At the Rhondda Valley end of the line, the Taff Vale Railway station at Treherbert is used as a terminus and 20 chains of that Company's line has to be traversed before the Rhondda and Swansea Bay Railway proper is reached. The first station is Blæn-Rhondda whence there is a stiff climb to the mouth of the tunnel, the summit being reached as the train emerges from the other end at Blængwynfy station. From Blængwynfy the line rapidly descends passing through a short tunnel *en route* to Cymmer, where there is a junction with the Llynvi and Ogmore section of the Great Western Railway. Cymmer is one of the largest stations on the line and serves Glyncorrwg and a populous mining district. Soon after leaving the station, the steel viaduct carrying the Great Western Railway across the Afon river is seen on the right, and from this point the line virtually follows the course of the mountain stream nearly to its mouth. Duffryn Rhondda Halt serves the Duffryn Rhondda Colliery, one of the many large pits scattered throughout the Afon Valley and producing large quantities of coal which pass over the railway for shipment at Port Talbot, Briton Ferry and Swansea. Passing Cynonville and Pontrhydyfen at the foot of the Afon Valley—whence a branch line to Cwmavon, Aberavon and Port Talbot was among the original proposals of the act of 1882,—the Cwmavon Railway, an older line connecting with some of the oldest steel works in South Wales, is reached. A short run brings us to Aberavon station at the end of the main street of Port Talbot, which is crossed on the level. Aberavon (Sea-side) attracts a great many visitors from the Rhondda and Afon Valleys during the summer months. A short distance beyond is Briton Ferry, at the mouth of the Neath river. At Port Talbot connection is made with the Port Talbot Company's lines into the docks, and at Briton Ferry junctions are made with the Great Western Railway dock lines, where a large tonnage of coal is dealt with, the tips at both places being almost continuously in use. At Court Sart, where is the junction with the Great Western main line, there is a branch to the town of Neath, with which a good service and connections with all main line trains is maintained. The Cape Copper Works are situated between Court Sart and Jersey Marine, near which latter station excellent golf links have been laid out. From here the line runs almost parallel with the Great Western low level lines to Swansea (East Dock) station and, after passing Danygraig, forms a connection with the Swansea Harbour Trust lines in order to obtain access to the Prince of Wales Dock. A few chains beyond the junction is the Swansea terminus, near the road entrance of the last named dock, on the eastern side of the River Tawe (New Cut).

The line is for the most part double, but portions including the Rhondda tunnel, are single and, although the banks are necessarily heavy on some portions of the route, the gradient is mainly "with the load" from the summit at Blængwynfy throughout the Afon Valley. The steepest rise is 1 in 39, and the sharpest curve 11 chains radius. The permanent way is similar to the Great Western standard pattern, the rails being 92½ lbs. per yard and the chairs weighing 52½ lbs each.

When the part of the Rhondda and Swansea Bay Railway over the Neath River was authorised, the Great Western Railway Company obtained running powers so as to connect their South Wales and Swansea and Neath lines, but since that time these have been extended under agreement. The portion between Cardonnel Junction, on the Vale of Neath section, and Court Sart Junction, between Neath and Briton Ferry, will now form an important link in the scheme of the Great Western Railway for a shortened and less congested route between Fishguard and London, by avoiding the busy area lying between Llanelly and Briton Ferry. The first portion, recently opened, of the Swansea District Lines of the Great Western Railway, stretching from Llangennech on the

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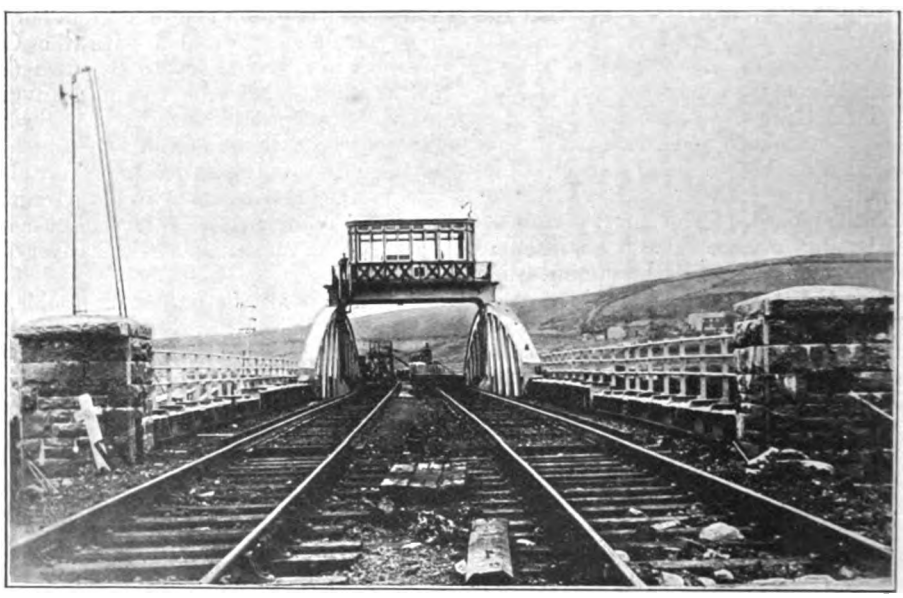
Llanelly Railway to Skewen on the main line near Neath, forms the basis of the new through route, which has already had the effect of removing congestion on the Great Western main line in the neighbourhood of Swansea. From this base spurs will be thrown up into the virgin coalfields of the Clydach, Cwmgorse, and Egel Valleys, but the line, instead of, as at present, forming a connection with the Great Western main line at Skewen, will effect a junction with the old Vale of Neath line to Swansea at Jersey Marine South. Just before reaching this point, however, a short loop line will connect with the Rhondda and Swansea Bay Railway at Cardonnel Junction, and, running over that railway to Court Sart, rejoin the Great Western main line there, thus avoiding a detour *viâ* Skewen and Neath. The scheme is both extensive and interesting as with the assistance of the Rhondda and Swansea Bay Railway the Great Western Company will have an additional fast route through what is probably one of the most congested portions of South Wales. Extensive works in connection with the junctions are still being carried out. The approaches to the Neath River Bridge are being widened and the curves at other points flattened, while at Court Sart, the present junction will form the connection with the "down" Great Western main line and the portion through Court Sart station a "flying" junction with the "up" line. In fact a through route, partly on the lines suggested by Brunel in the "forties," will, by the use of the Neath crossing line of the Rhondda and Swansea Bay Railway by the Great Western Railway, be accomplished; and in this connection it is a coincidence that Mr. Yockney, the engineer of the Rhondda and Swansea Bay Railway, was a pupil of Mr. Brunel's.

In 1891, when the line was opened to Aberavon only, there were eight passenger trains from the latter station each weekday, and six arrivals, with two trains in each direction on Sundays. On the opening of the line throughout to Swansea in 1895 a similar service was maintained, while at the present time there are eight passenger trains each way, with additional ones all or part of the way on Saturdays, and two each way on Sundays.



NEATH RIVER BRIDGE, NEARING COMPLETION.

As evidence of the important part played by the Rhondda and Swansea Bay Railway and the convenience it affords the public, it may be mentioned that connections are maintained with several other railways at various points. With the Taff Vale Railway, for instance, there is a through service to Cardiff *viâ* Treherbert; at Cymmer access to the Llynvi and Ogmore valleys is obtained over the Great Western Railway; at Port

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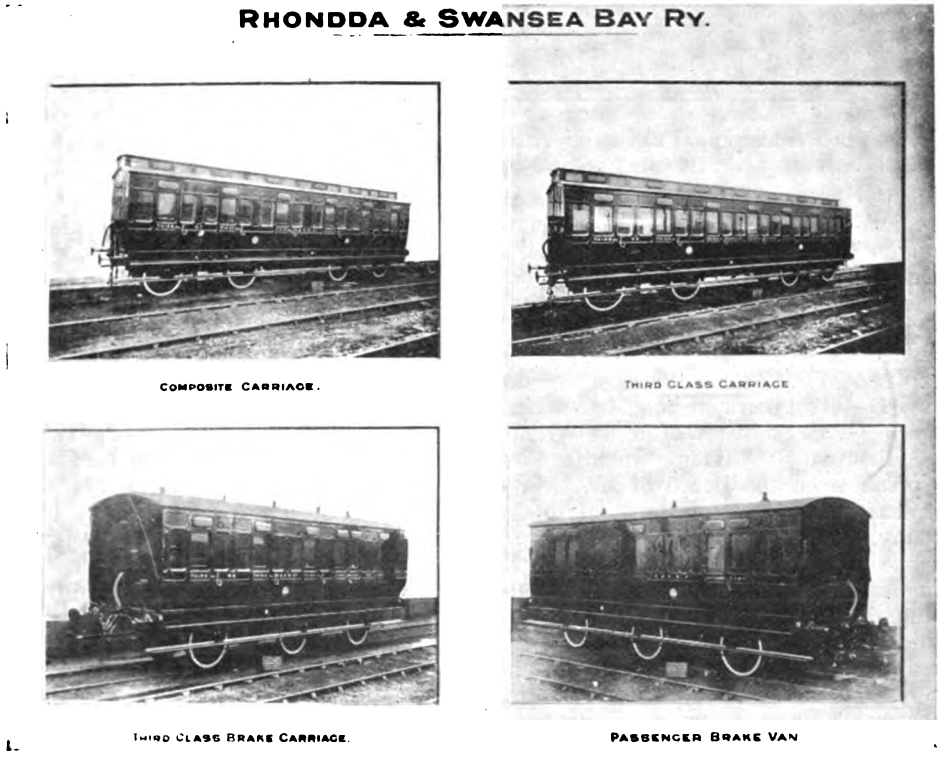
Talbot connections are made with the Port Talbot Railway, and both there and at Briton Ferry with the Great Western Railway to places west and to the south of Ireland *vid* Fishguard.

At the commencement the Company possessed 15 locomotives built by Beyer, Peacock & Co., of Manchester, and Kitson & Co., of Leeds. They are all fitted with side tanks and are six-coupled and four-coupled for goods and passenger work respectively. The number of engines has since been increased to 29, while the passenger carriages, which numbered 50 at the outset, now total 81, and were built by Messrs Brown, Marshall & Co., of Birmingham, and the Ashbury Railway Carriage Wagon Co. They are mainly composite 1st and 2nd, and 3rd class coaches and are painted chocolate colour and lettered R. & S. B. Railway, with number of class and monogram painted on each side. The goods wagons have increased from 500 to 856, and were supplied by the Oldbury Wagon and other firms.

As might be expected from the genesis of the line, the major portion of the traffic is mineral, chiefly coal. This, with the merchandise, forms about two-thirds of the total, the remaining one-third representing passenger and parcels traffic. Huge quantities of coal, drawn from the Rhondda and Afon Valleys, are poured into the docks at Port Talbot, Briton Ferry and Swansea, and the anticipations of the promoters that a considerable portion of the output from the western end of the Rhondda Valley, intended for shipment, would be diverted by way of these ports, has been realised.

The Rhondda and Swansea Bay Railway have extensive accommodation for the shipment of coal at the Prince of Wales Dock, Swansea. Three hydraulic tips, each capable of loading 600 tons per hour, with the necessary loaded and empty roads, are owned by them on the eastern side of the dock, where steamers of large capacity ship for all parts of the world. Further tips are being erected at the new King's Dock and will soon be brought into use.

Serving a populous mining district and passing through various towns, the passenger traffic of this line is somewhat peculiar in that a train will be filled and emptied several times on its journey, especially on market days and Saturdays. At holiday times and



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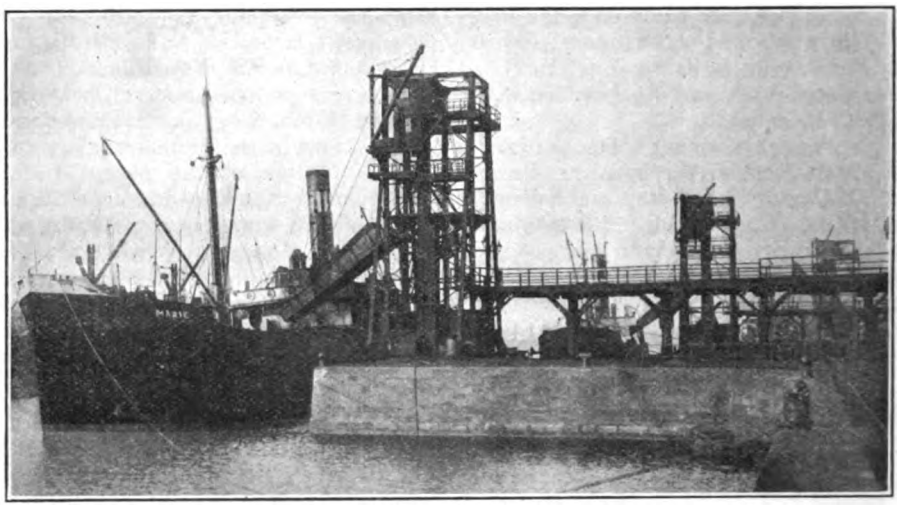

RHONDDA AND SWANSEA BAY RAILWAY: COAL TIPS, PRINCE OF WALES DOCK, SWANSEA.

during the summer months there is, as already mentioned, a considerable traffic to Aberavon (Seaside) requiring special trains to convey the crowds of excursionists.

The present chairman of the company is Mr. George Deer, of Port Talbot, who succeeded Mr. Morgan B. Williams in 1911. Mr. W. H. P. Jenkins, of Bristol, acts as Deputy Chairman and Messrs Fred E. Jacob, A. P. Steeds, W. Charles Wright, and Milbourne B. Williams are directors. The presence on the Board of Mr. George Deer, has been a great acquisition to the company. Being connected with the copper trade he has been instrumental in contributing large quantities of traffic by the route of the company over which he so ably presides, and since his connection with the company he always has and continues to be ever on the alert in the interests of his shareholders. The company are also fortunate in having as a director Colonel Charles Wright, (the only son of Colonel J. Roper Wright, chairman of the Port Talbot Railway & Docks Co.,) who being connected with very large steel and colliery undertakings is in a position to place large quantities of traffic on the Railway. Mr. F. E. Jacob, is a colliery owner in the district and a large freighter, while the other directors whose names we have mentioned take the greatest possible interest in the affairs of the Company.

Mr. John David, the General Manager, was formerly in the service of the Great Western Railway, with which Company close working arrangements are now in force. Commencing at Hirwain in the early seventies, he remained in the service of the Great Western Company until 1885, when he was selected to fill the post of traffic Manager to the Rhondda and Swansea Bay Railway, then in its infancy, and the success which attended his efforts in piloting the Company through the early stages of its career and in inaugurating the working of various portions of the line and fixing the rates, fares, and charges, &c., caused his advancement to the position of the first General Manager, which position he has continued to occupy with signal ability. His offices are in Fisher street, Swansea.

The other officers are Mr. W. Sutcliffe Marsh, consulting engineer; who was Mr. Yockney's resident engineer during the construction of the line, and who was largely responsible for the satisfactory completion of the work; Mr. E. Lewis Jones, Secretary; Mr. R. Oliver, locomotive superintendent; and Mr. W. G. Sing, Accountant; the solicitors being the old-established firm of Messrs Strick & Bellingham, Swansea, who have been the legal advisers of and acted for the Company from its inception down to the present time. The traffic department staff numbers 263 of whom 60 are clerical and 203 uniform, these figures, of course, excluding the engineering and locomotive dept. staffs, the total number employed on the railway being altogether over 600.

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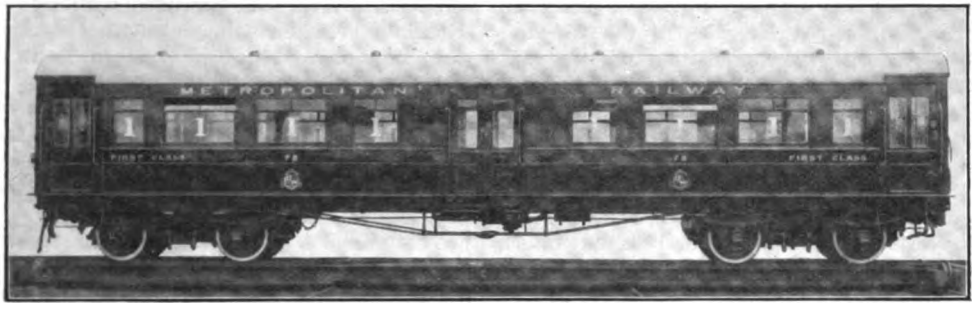

ONE OF THE LATEST VEHICLES USED FOR ELECTRIC SERVICES: METROPOLITAN RAILWAY.

The Transformation of the Metropolitan Railway.

THE underground railways of London indicate the policy of improvement and development which now characterises railway activity more markedly than any other system of lines, mainly owing to the drastic changes involved by electrification; and for several years now the two great electric systems, the Metropolitan and the Metropolitan District, have apparently vied with one another as to which can achieve the more remarkable record of progress. On both lines station reconstruction has figured prominently; but it is now necessary to refer to even a higher development in the case of the former line, in that, in conjunction with the reconstruction and enlargement of Baker Street station, a magnificent block of offices to accommodate the headquarters staff and concentrate the various departments has been erected there, and from February 17th has replaced the old General Offices at Paddington, and departmental offices elsewhere.

For over half a century the headquarters of the Metropolitan Railway Company have been situated in Westbourne Terrace. The continuous growth of the line, however, has entailed an almost continuous demand for increased staff accommodation, and this has been dealt with when exigencies have become acute, as well as circumstances would allow. But it has long been evident that in the interests of economy and proper interworking, it was imperative that the scattered and, in some cases, isolated departments should be consolidated under one roof and put in direct communication with the railway traffic.

Designed on the neo-Greek style with a main frontage overlooking Regent's Park, the new railway building is constructed of reinforced concrete with faience facing. It has four stories of imposing appearance, facing Allsop Place, and seven on the station side, there being two levels, though the altitude of the building is equal. About an acre of floor space is comprised in the premises, which contain about five miles of electric wires, and over 8,500 ft. of hot water pipes. Automatic electrical lifts give access to the different floors and communicate with the various departments.

Arrangements have been made with the Strand Hotel Company, Ltd., for the erection of an hotel on the site created over and adjoining the new station at Baker Street. In order to afford increased facilities for through communication between the Metropolitan and London Electric Railways at Baker Street, escalators are being installed at joint expense.

When the Metropolitan Railway Company fixed their general offices in Westbourne Terrace, the railway was only a little over three miles long, against 82¾ miles at the present day. The company, in addition to the Inner Circle, with which it has always been prominently associated, controls, with the forthcoming extension to Watford, seven different railway routes, almost all of which are worked at very high pressure, and have increased their passenger traffic from nine to over one hundred million passengers per annum.

Widenings between Finchley Road and Wembley Park and the reconstruction of the stations at Finchley Road and Neasden have now reached a forward condition. Sections of the widened lines have been

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completed and brought into use, affording greatly improved facilities in the working of the train service, and enabling the fast trains to be kept partially distinct from the others, incidentally giving an indication of the possibilities which will be realised when the work is completed.

Several other matters affecting the future progress of the Metropolitan Railway and associated lines may also be referred to. In order to improve the earning capacity of the Hammersmith and City Railway—Metropolitan and Great Western Joint—and to develop the traffic upon it, an agreement has been entered into with the Great Western Railway, under which the line will in future be more directly under the management of the Metropolitan Company, and a number of improvements, including the construction of new stations at Goldhawk Road and Uxbridge Road respectively, are provided for. Arrangements are also being made for the revival of through working to Richmond when the electrification of the London and South Western Railway permits of this.

The re-construction of Praed Street station, Paddington, is nearly completed, and arrangements have already been made for the occupation of the new shops and tea-room at satisfactory rentals.

A large block of flats has been constructed over the railway near Regent's Park and is nearly ready for occupation. A contract has also been let for the building of a block of shops and flats in the front of the new Finchley Road station on a valuable site obtained by girdering over a part of the line.

In order that current for working the Great Northern and City line may be obtained on the most economical basis, provision is being made for its supply from the Neasden Generating Station. The work includes the erection of a sub-station with

A STRIKING VIEW SHOWING THE NEW HEADQUARTERS OF THE METROPOLITAN RAILWAY.

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the necessary equipment at Drayton Park, and the installation of additional switchgear at Moorgate Street sub-station.

The extension from Moorgate Street to Lothbury has received Parliamentary sanction, and as already announced, the Great Northern Railway has become associated with the Great Northern and City undertaking, and a Joint Bill has been promoted, of which the following are the main objects: (1) The Great Northern Company at their own expense to construct a junction between their line and the Great Northern and City Railway in the neighbourhood of Drayton Park, which will enable their main line suburban trains to be brought through to the City, and so accomplish the original object of the undertaking. (2) The Great Northern Company to bear one-half the expense of constructing the proposed railway to form a junction with the Metropolitan Inner Circle Railway, and the extension of the line from its present terminus at Moorgate Street to Lothbury and the Bank; (3) A joint committee of the Metropolitan and Great Northern Companies to take a lease of the Great Northern and City line at a rent equal to the dividend on the stocks of the Metropolitan Company issued as the purchase price to shareholders of the Great Northern and City Company; and (4) All profits earned above the rent to be divided equally between the two companies.

Routes controlled by the Metropolitan Railway, exclusive of the Inner Circle, are as follows:—Hammersmith line from Edgware Road to Hammersmith, with the loop to Addison Road; East London route joining the Circle at Aldgate, passing through Whitechapel and by the London docks to New Cross; Great Northern and City line, recently acquired by the Metropolitan Railway Company, extending from Moorgate through Highbury to Finsbury Park; St. John's Wood line to Finchley Road and Willesden Green, now extended to Harrow and north to Chesham and Aylesbury, with branches to Verney Junction and Brill; and the electric line from Harrow to Uxbridge, which traverses the rural districts of Eastcote, Ruislip, and Ickenham. All these sections are electrically operated, except the line from Harrow north, which is worked by steam locomotives.

It is worthy of note that already Harrow can be reached in 17 minutes from Baker Street in consequence of the relief afforded by the additional tracks from Finchley Road to Kilburn, and many of the local stations now obtain a magnificent train service. From Willesden Green and Cricklewood there are 68 through trains daily to City stations, with 229 others which involve a convenient change at Baker Street only. In some cases the journey from Kilburn-Brondesbury to Moorgate Street can be made in 19 minutes. By the Metropolitan Railway and associated lines the passengers can travel to almost any part of London, in most cases without any change of train, and in others, a change from one train to another at Baker Street.

The season ticket rates are very cheap, and the list of season ticket holders on the "Met." is increasing daily. A feature of the season ticket arrangements is the half-rate season tickets for ladies, and this concession has resulted in a large number of tickets being taken out. If a passenger through business or holiday reasons is not able to use a season ticket for a period, it can be handed in at his station and the unused period is added to any ticket he may take up in the future. This arrangement also applies from "Met." stations to Tube stations.

For those not wishing to purchase a "Season," cheap weekly tickets are issued at a great reduction on the ordinary fare. "Workmen" low fares are in operation, and tickets can be purchased weekly, as well as day by day at the booking office.

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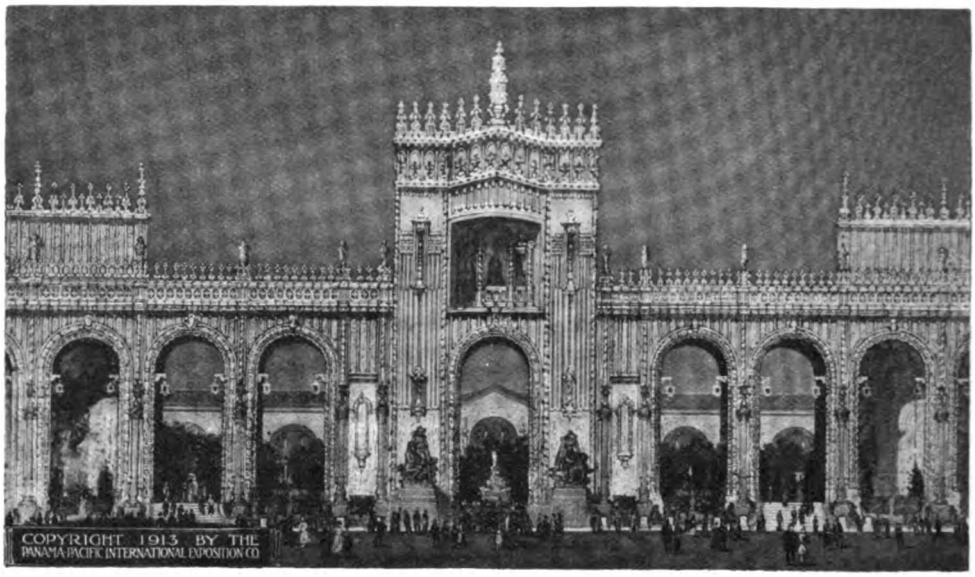

PANAMA-PACIFIC INTERNATIONAL EXPOSITION: FAÇADE, COURT OF ABUNDANCE.

Panama-Pacific International Exposition, San Francisco, 1915.

TO celebrate the completion of the Panama Canal, by the United States there will be held, in 1915, an International Exposition at San Francisco, the site having been chosen in token of the importance of the Isthmian waterway to the Pacific Coast. A special RAILWAY MAGAZINE correspondent supplies some interesting facts about the great festival, which is based on the opening of the Panama Canal—the realization of a dream cherished by the maritime world for upwards of four hundred years.

At the time of writing, twenty-seven foreign governments have announced their intention to share formally in the Exposition, and others are expected to do so in due course. Thirty-five states and territories of the American union have announced that they will participate officially. Careful investigators estimate the minimum attendance at the Panama Pacific International Exposition at 10,000,000, while most of them place the total at figures varying between 12,000,000 and 18,000,000. The gates of the Exposition will be opened on February 20th, and closed on December 4th, 1915.

Occupying 625 acres on the shores of San Francisco Bay, the Exposition will have a water frontage of about two miles. According to conservative and accurate estimators it will be an $80,000,000 affair, the several amounts aggregating this vast sum being as follows:

State of California	$5,000,000
City of San Francisco	5,000,000
Subscribed by citizens of San Francisco	7,500,000
Foreign governments (estimated)	10,000,000
Counties of California	2,000,000
U. S. Government	1,000,000
Individual exhibitors, for installation and maintenance (estimated)	25,000,000
Installation, equipment, and operation of concessions (estimated)	10,000,000
Operation after opening and winding up by Exposition (estimated)..	7,000,000
States of the American Union (estimated)	8,000,000
Total	$80,500,000

Exhibits have been divided into eleven departments, as follows:—(A) Fine Arts. (B) Education. (C) Social Economy. (D) Liberal Arts. (E) Manufactures and Varied Industries. (F) Machinery. (G) Transportation. (H) Agriculture. (I) Live Stock. (K) Horticulture. (L) Mines and Metallurgy.

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Each department is expected to outdo anything ever attempted before. All the main exhibit palaces are to be completed by July, 1914, eight months in advance of the opening of the Exposition.

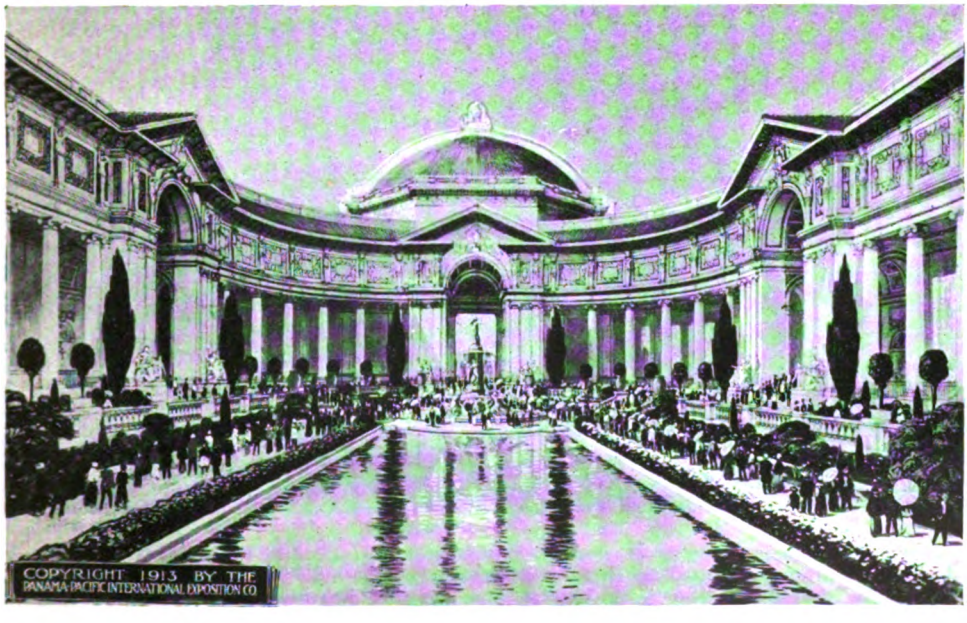
A point of departure from the accepted character of expositions, is the decision to make this a "City of colour." Heretofore the "White City," with its enchanting suggestion of marble and alabaster, has been the usual ideal of exposition architecture, but in this case, although there will be no glaring colours, the ground tone will be the colour of Travertine Stone, special colours being Pompeiian red, strong Italian blues, vermilion, and orange tones. Much of the statuary, particularly the groups, will be warm with colour.

The plan of the buildings is unique. There will be no assembling of individual palaces separated by huge areas, but instead there will be presented a stupendous Oriental bazaar, similar in form to the bazaars of the East, Constantinople, Damascus, and Cairo, with roofs of reddish pink spreading over fifty acres, beside the blue waters of the bay; its cornices supporting warmly tinted figures; its towers and minarets pranked with red, blue, and orange; its domes flashing with gold and copper.

From an architectural point of view, the dominating theme of the Exposition will be the huge tower of the administration building, 425 ft. high and flanked on either side by the gilded domes, towers, and minarets of the remaining buildings of the group. The largest building group will be the Palaces of Agriculture, covering, in two sections, a floor area of 680,000 sq. ft.

Entirely surrounded by a colonnade composed of massive arches, and surmounted by groups of statuary, symbolizing the rising and setting sun, the Court of Honour will be one of the finest features of the Exposition. The figures will be fourteen ft. high and the head of each will be crowned with a star measuring four ft. across, These stars will be studded thickly with prisms to imitate precious stones, which, added to the colouring of the sculpture, will supply magnificence.

A great Scintillator will be mounted about five or six hundred yards out in the water. It will be placed on a barge anchored in the bay and sixty trained men will be required to operate the lights. These men will be drilled to go through an evolution of colour, throwing gorgeous auroras into the sky. The spread of these colours will be visible on clear nights in the sky for forty or fifty miles.



PANAMA-PACIFIC INTERNATIONAL EXPOSITION: PART OF THE COURT OF PALMS.

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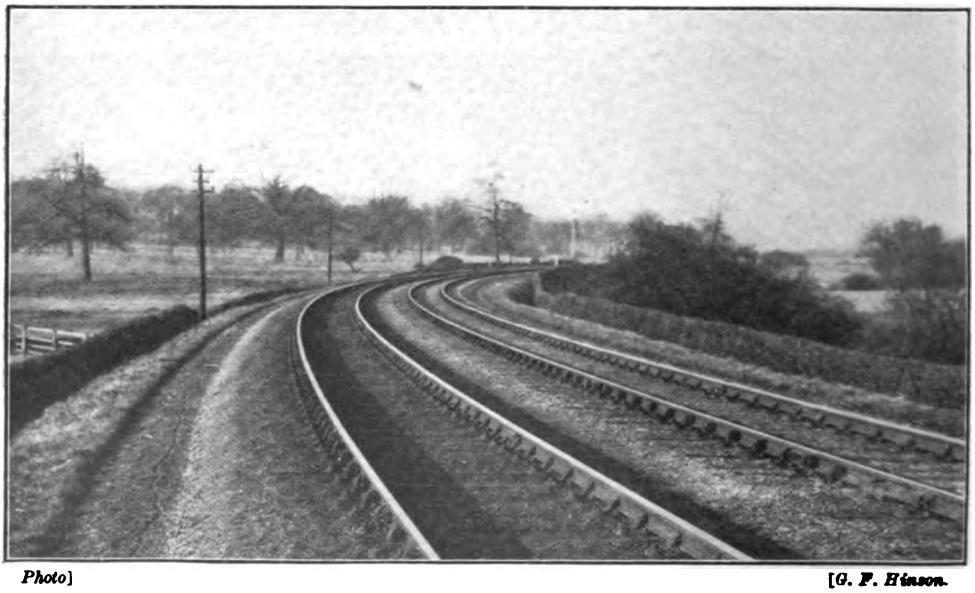
The Exposition Company has nearly completed the installation of its own standard gauge railway system for the expeditious delivery of material and exhibits during the pre-Exposition period and the removal after the close of the Exposition. By means of this railway, in connection with the special freight ferry slip, exhibitors may have the cars loaded at point of shipment and delivered at San Francisco within the very buildings in which they will be displayed to the inspection of the world. Shipments by water will be rushed by rail from the docks where discharged to the buildings for which they are destined.

The system will aggregate about ten miles of track, and will extend from the ferry slips at the eastern end of the grounds, through the entire area occupied by the main exhibit palaces, thence to the live stock and aviation tracts at the Western end on the Presidio military reservation. In every way, the tracks will be the same as the standard tracks in use on the trunk lines throughout the country, with steel rails weighing seventy five pounds to the yard, well ballasted. There is a commodious railway yard adjacent to the ferry slips, east of the big Palace of Machinery, with accommodation for 200 cars at a time.

More that half of the rails have been laid already and the tracks are extending rapidly in all directions. Spur tracks will enter all the main exhibit palaces. The engines are ready whenever needed and within a very short time they will be put into service gradually as required. Some loaded cars have already arrived on car floats at the freight ferry slip and have been run by hand or by animal power for varying distances.

Between February 20th, and December 4th, 1915, while the Exposition is open, some of the tracks will be removed temporarily but most of them will be buried beneath soil. and drive ways, walks, or gardens placed over them. At the end of the Exposition period they will be uncovered and restored to service for removal of what was brought in over them.

Railways and the Picturesque.



Photo] [*G. F. Hinson.*

On several occasions photographs have been reproduced indicating that railway scenes often include picturesque and artistic characteristics, and we are indebted to Mr. C. F. Billing for the print, reproduced above, showing a view on the Leicester-Peterborough section of the Midland Railway between Stamford and Ketton, looking towards the latter station. The photograph was taken from what is known as the White Bridge, a footbridge leading from Stamford meadows to Easton fields.

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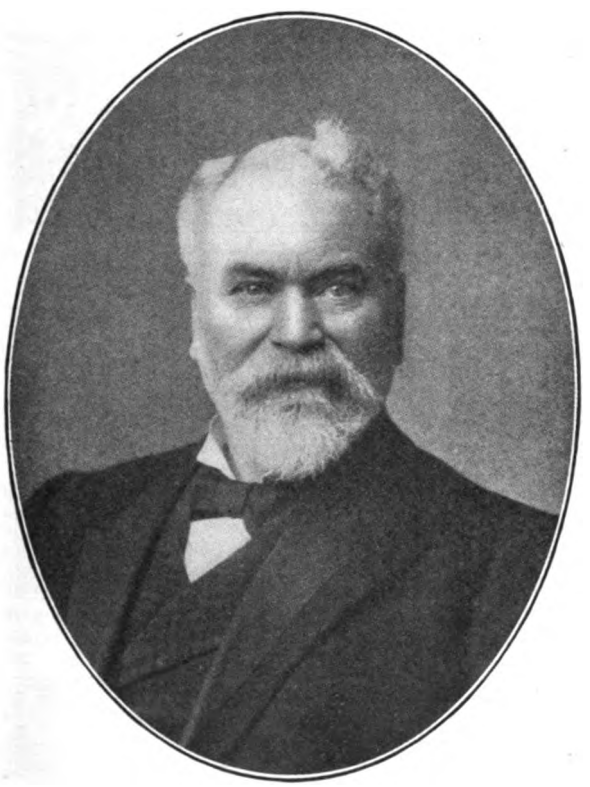
The McIntosh Locomotives of the Caledonian Railway.

By ALEX. K. BOWMAN.

IN view of the retirement of Mr. John Farquharson McIntosh, M.V.O., from the position of Locomotive, Carriage and Wagon superintendent of the Caledonian Railway, which he has held since February, 1895, this article is peculiarly apposite. It is not too much to claim that Mr. McIntosh's influence upon modern locomotive design has been far-reaching. To him is generally attributed the initiation of the cult of the big boiler, and the earlier "Dunalastairs" were largely responsible for the high standard of locomotive performance and traffic working which has for so long been characteristic of the Caledonian Railway. It is true that No. 721 and her sister engines would not now rank as anything exceptional in respect of boiler and general dimensions, but when first introduced, *Dunalastair I.* represented a considerable advance. Mr. McIntosh has also the unique distinction of having influenced the locomotive practice of a foreign country. Ever since five engines of his *Dunalastair II.* design were built by Messrs. Neilson, Reid and Co., Springburn, Glasgow (now The North British Locomotive Co., Ltd.) to the order of the Belgian State Railways, the older methods of construction previously in vogue in Belgium have been almost entirely discontinued; and although Mons. Flamme and his colleagues have produced their own designs in course of development, Mr. McIntosh's influence can still be observed.



MR. J. F. MCINTOSH, M.V.O.,
Locomotive, Carriage and Wagon Superintendent,
Caledonian Railway, 1895–1914.

It was in 1896 that No. 721, *Dunalastair*—since provided with the suffix *I.*, to distinguish it from its larger successor, No. 766—was constructed at the St. Rollox Works of the Caledonian Railway, the series being completed by Nos. 722 to 735. The engines which ran over Beattock summit had at all times been classed among the smartest, but the "Dunalastairs" at once established themselves in a position far ahead of the best of earlier years. Their success was assured from the first, and ever since the course of locomotive construction, not only on the Caledonian, but also on other lines, has been set definitely in the direction of large boiler dimensions. The heating surface of the first "Dunalastairs" totals 1,403 sq. ft.—218 sq. ft. greater than that of the most famous of the 1895 "racers."

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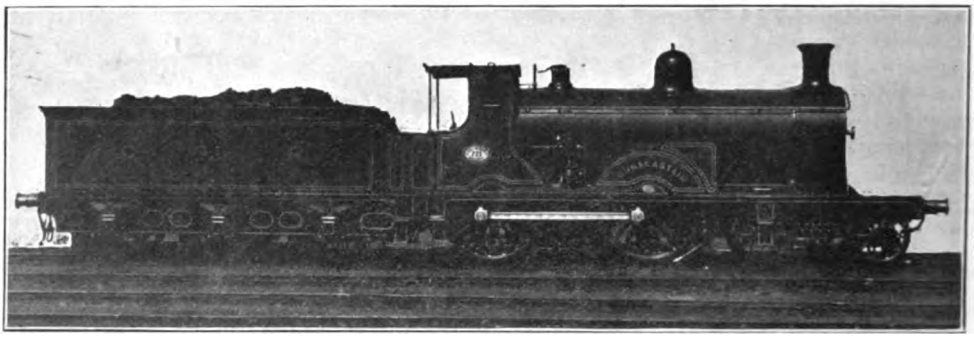
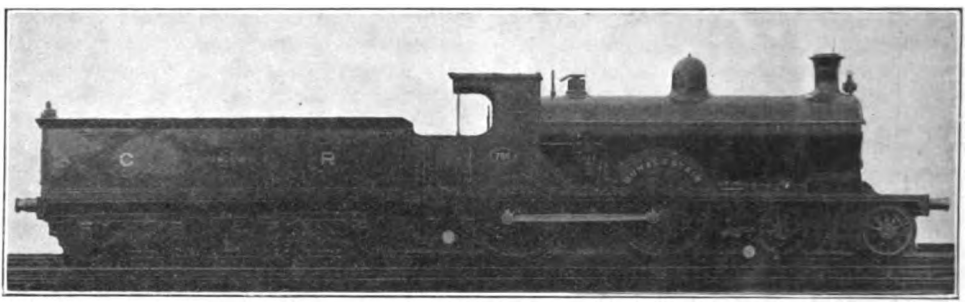
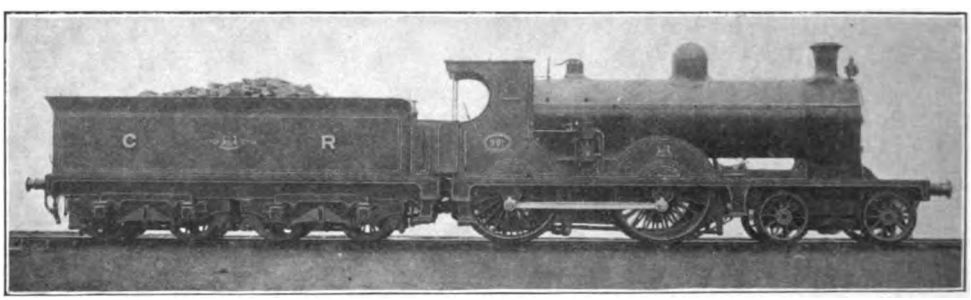


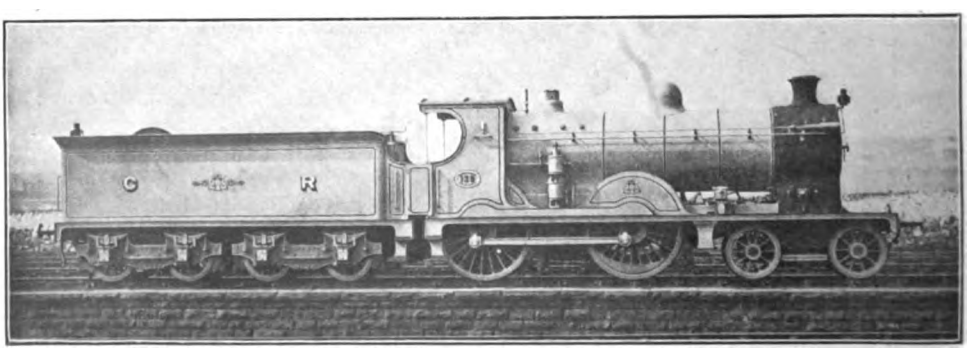
No. 721. *Dunalastair* (*I.*)



No. 766. *Dunalastair* (*II.*)



No. 901. THIRD "DUNALASTAIR" CLASS.



No. 139. FOURTH "DUNALASTAIR" CLASS, FITTED WITH SCHMIDT SUPERHEATER.

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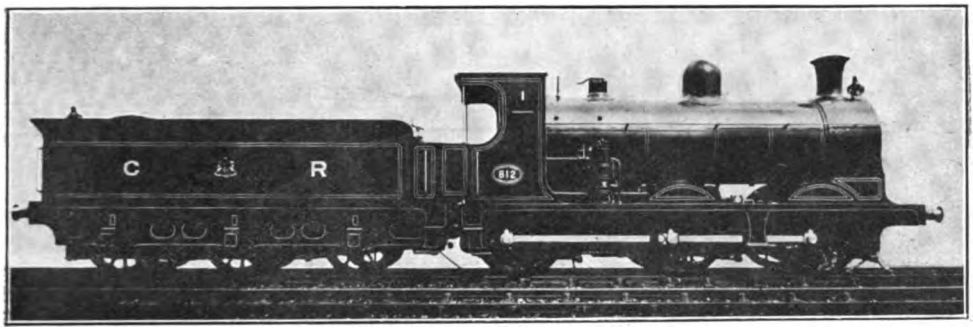


STANDARD GOODS ENGINE No. 812.

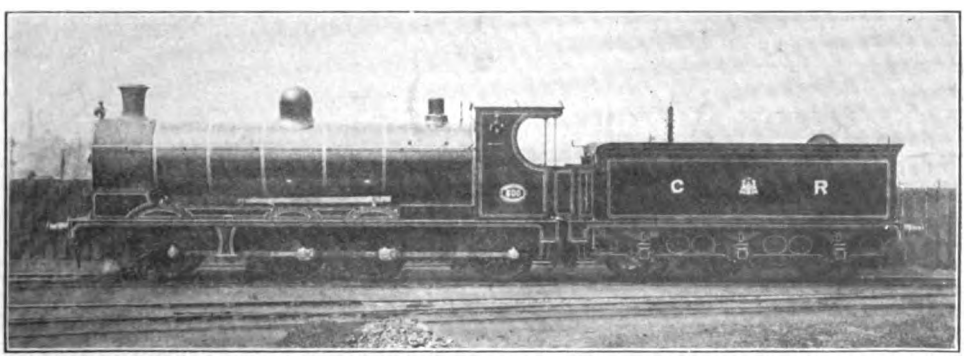
Mr. John Lambie's No. 17 class, which until then had been the most important and most powerful engines on the line. The following comparison between No. 17 and No. 721 is of interest :—

No.	Cylinders.	Diam. of Cpd. Wheels	Heating Surface.	Grate Area.	Working Pressure.	Total weight in working order.
17	18″ by 26″	6′ 6″	1,185 sq. ft.	19·5 sq. ft.	160 lbs. per sq. in.	84 tons 5 cwt.
721	18¼″ by 26″	6′ 6″	1,403 sq. ft.	20·63 sq. ft.	160 lbs. per sq. in.	86 tons 5 cwt.

During the great coal strike of 1912, No. 724 and a few others were adapted to the use of oil fuel. It cannot be said that these were actually in regular service, but should such conditions again arise, they will no doubt be ready to take over any work which may be allotted to them.

Simultaneously with the " Dunalastairs," two other classes of engines were turned out from St. Rollox—the No. 25 class of side tank engines, and the No. 747 series of goods locomotives. The former were of the 0–4–4 T type, and are now largely employed on local services in the Glasgow district, while the latter are 0–6–0's with 5 ft. coupled wheels and a heating surface of about 1,200 sq ft. The varied duties performed by the latter speak eloquently of their qualities. They work all over the system, particularly, however, in the haulage of heavy mineral and goods trains in the Glasgow and Motherwell districts. A number of them are permanently employed on passenger trains out of Glasgow Central, these being fitted with Westinghouse brakes and painted the usual Caledonian blue.

The work done by the 721 series was so remarkable that an enlarged design was almost immediately taken in hand, and in 1897 the second class of the name was introduced. Of these, No. 766—for a long period this engine was known as *Dunalastair II.* and No. 780 as *Breadalbane*—is representative. In passing, it is perhaps worthy of note that the naming of Caledonian locomotives



No. 600. EIGHT-COUPLED MINERAL ENGINE.

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Leading Dimensions of Caledonian Locomotives.

Designed by Mr. J. F. McIntosh.

R—Rebuilt. A—As originally built. B—As rebuilt and fitted with Schmidt Superheaters.
C—Built with Schmidt Superheater. D—Built with Robinson Superheater.

Number of Locomotive Initiating Class	721	25	717	766	897	282	97	169	787	60 R	600	55
Type	4-4-0	0-4-4 T	0-6-0	4-4-0	4-4-0	0-6-0	0-4-4T	0-4-4T	0-6-0T	4-4-0	0-8-0	4-6-0
Cylinders (in.)	18½x26	18×26	18×26	19×26	19×26	18½x26	18×26	17×24	18×26	18×26	21×26	19×26
Coupled wheels	6′ 6″	5′ 9″	5′ 0″	6′ 6″	6′ 6″	5′ 0″	5′ 9″	4′ 6″	4′ 6″	6′ 0″	4′ 6″	5′ 0″
Leading or bogie wheels	3′ 6″	3′ 2″	—	3′ 6″	3′ 6″	—	3′ 2″	2′ 6″	—	3′ 6″	—	3′ 6″
Steam pressure (lbs. per sq. in.)	160	150	150	175	180	160	150	150	156	160	165	175
Heating surface, tubes (sq. ft.)	1284·5	984·6	1056·8	1381	1402	1284·5	894·6	975	975	1284·5	1970	1705
,, ,, firebox (sq. ft.)	118·7	111·16	112·4	119	138	118·7	111·16	111	111	118·7	138	105
,, ,, superheater (sq. ft.)	—	—	—	—	—	—	—	—	—	—	—	—
,, ,, total (sq. ft.)	1403·2	1095·76	1169·2	1500	1540	1403·2	1095·7	1086	1086	1403·2	2108	1810
Grate area (sq. ft.)	20·6	17	19·5	20·6	23	20·6	17	17	17	20·6	23	20·6
Adhesion weight (tons)	31½	32½	40½	32½	34½	45½	33½	32	47½	31	—	42½
Total weight, engine (tons)	47	53½	40½	49	51½	45½	55½	51½	47½	46	60½	57½
Weight, engine and tender (tons)	86½	—	75½	94	96½	83½	—	—	—	86	97½	94½

Number of Locomotive Initiating Class	49 A	49 B	492	140	903 A	903 B	908	918	139 C	120 D	90 C	94 C
Type	4-6-0	4-6-0	0-8-0T	4-4-0	4-6-0	4-6-0	4-6-0	4-6-0	4-4-0	4-4-0	0-6-0	2-6-0
Cylinders (in.)	21×26	20½×26	19×26	19×26	20×26	20½x26	19×26	19×26	20½x26	20×26	19½x26	19½x26
Coupled wheels	6′ 6″	6′ 6″	4′ 6″	6′ 6″	6′ 6″	6′ 6″	5′ 9″	5′ 0″	6′ 6″	6′ 6″	5′ 0″	5′ 0″
Leading or bogie wheels	3′ 6″	3′ 6″	—	3′ 6″	3′ 6″	3′ 6″	3′ 6″	3′ 6″	3′ 6″	3′ 6″	—	3′ 6″
Steam pressure (lbs. per sq. in.)	200	175	175	180	200	175	190	175	165	170	160	160
Heating surface, tubes (sq. ft.)	2178	1509·3	1076·3	1470	1111·75	1666	1895	1716	1220	1220	1071·3	1071·3
,, ,, firebox (sq. ft.)	145	145	112·7	145	148·25	148·25	128	128	145	145	118·8	118·8
,, ,, superheater (sq. ft.)	—	515·7	—	—	—	515·75	—	—	330	295	266·9	266·9
,, ,, total (sq. ft.)	2523	2170	1189	1615	2260	2330	2023	1844	1695	1666	1457	1457
Grate area (sq. ft.)	26	26	19·5	21	26	26	21	21	21	21	20·6	20·6
Adhesion weight (tons)	53½	54½	62½	35½	54½	55½	49	46	38	38	51½	46
Total weight, engine (tons)	70	71½	62½	54½	73	74½	64	60½	59	59	51½	54½
Weight, engine and tender (tons)	125	126½	—	107½	130	131½	102	98½	115	115	89½	91½

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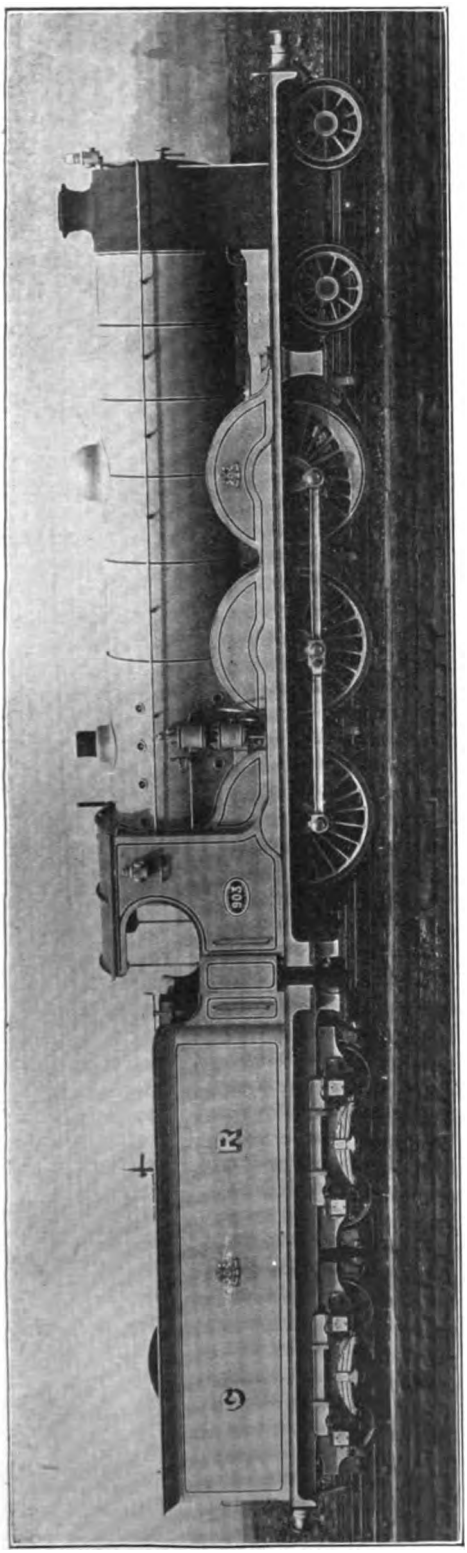

No. 903, NOW NAMED *Cardean* AND FITTED WITH SCHMIDT SUPERHEATER.
This engine is systematically employed on the 2 p.m. express from Glasgow (Central) and the corresponding return service leaving Carlisle at 8.13 p.m.

appears to have gone out of fashion. Among others, Nos. 723 and 724, once named respectively *Victoria* and *Jubilee*, have been divested of their significant titles.

The coupled wheels of the 766 class were identical with those of their predecessors, but the cylinders were enlarged to 19 in. diameter, and the heating surface to 1,500 sq. ft., while the working pressure was increased to 175 lbs. per sq. in. The tractive force is 16,840 lbs., and the weight in working order (94 tons) was considerably augmented, as compared with that of No. 721, by the fact that the tenders of the 766 series were very much enlarged, and, for the first time in Scotland, were carried on two four-wheeled bogies. They have capacity for 4,125 gallons of water, together with a fuel space of 5 tons. The arrangement of the springs on these tenders was new. Instead of springing each axle separately, a method similar to that on the leading bogie of the engine was adopted. A large inverted laminated spring, situated between the axle-boxes of each bogie, was used in place of two ordinary ones. All engines so fitted are likely to remain unaltered, but in 1910 the separate springing of each axle was reverted to on all new engines. In the construction of each engine are embodied many of the minor details which go to make up the striking individuality of the Caledonian locomotive—the conventional whistle, for example, is absent, and in its place is a deep-sounding horn, dominant over all others in a joint station. Again, the non-acceptance by the Caledonian of the usual standard code of head lights has led to the placing of two brackets, one on each side, near the top of, and outside, the cab. The lamps are placed on these, and show, generally, one white and one green light from the front, and one white and one red from behind. The utility of this practice is readily seen. The additional height brings them earlier into the line of vision, and—a more practical result—they can be manipulated by the fireman without his leaving the cab. Then, so far as internal design is concerned, Mr. McIntosh's spark-arrestor and steam reversing gear call for special notice. By the former the live sparks that may be sucked through the boiler tubes strike against the arrestor and are precipitated into a pit at the bottom of the smoke-box. In the steam reversing gear the usual hand lever and notch-plate have been retained, so as to accord with ordinary methods.

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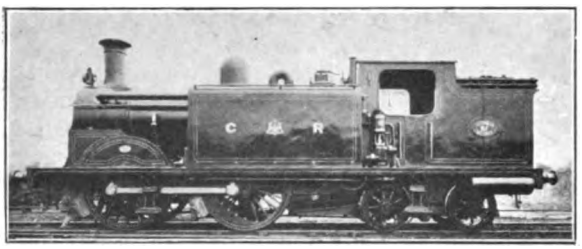


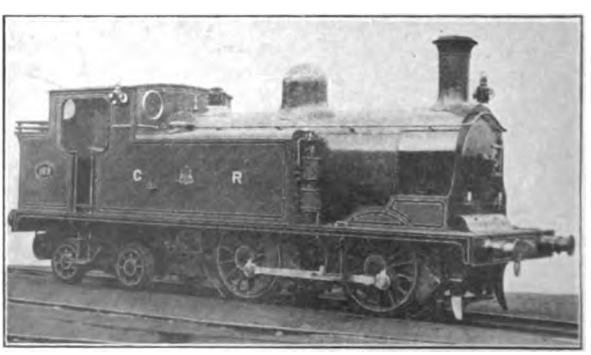
0–4–4 PASSENGER TANK ENGINE (5 FT. 9 IN. CLASS) EQUIPPED WITH CONDENSING APPARATUS.

While the 721 class are now mostly employed in the Glasgow and Edinburgh districts, with an occasional run north to Crieff or Perth, the 766 series are still widely used on main line work all over the system. Their performance is consistent and remarkably fine, and, in common with the 900 class—the third *Dunalastair* series, next to be considered—they excel not only on the long non-stop runs, as between Carlisle and Perth, but also on the short, fast point-to-point runs for which the Caledonian is well known—such as the 33 min. (summer) booking from Perth to Forfar, and the 37 min. booking from Perth to Stirling. The class numbers inclusively 766 to 780.

The years 1898 and 1899 witnessed the introduction of the 900 class, the engines of which, with their 4 ft. 9½ in. boiler diameter, mark still a further advance in size and power. The cylinders and coupled wheels remained the same as in the 1897 engines, but the grate area became 23 sq. ft., the heating surface 1,540 sq. ft., and the working pressure 180 lbs. per sq. in. The tenders are substantially similar to those of the 766 series, but the weight overall and in working order is 96·7 tons. These locomotives have great capabilities for hard running with heavy trains. They rank among the most efficient locomotives in the country, possessing, as they do, qualities which frequently enable them to *get there* ahead of larger and more powerful classes which, in theory, should make the better time. They number inclusively 887 to 902, and until 1906 the brass plate of the last of the series bore a higher number than that of any other locomotive in Scotland, save those of a few engines on the duplicate list, which are distinguished by having 1,000 added to the original figures.

Members of the 900 class are naturally to be found on every section of the main line. Their work on the Carlisle road, which involves the climbing of the 1,014 ft. to Beattock summit, is particularly gratifying. One night last summer, when the writer had occasion to travel south by the 10.45 p.m. *ex*-Glasgow Central, No. 895 ran to Carlisle in just over the two hours, including a stop of almost five minutes at Carstairs Junction, whence the load was 310 tons. This is the finest run on this section which has hitherto come under notice, and it is to be regretted that the darkness of the night prevented detail timing. There is one run, however, which, so far as Scottish locomotive performance is concerned, stands out as almost a record. This was made by Driver Ranochan with No. 902 and about 150 tons on February 6th, 1906, between Glasgow Central and Dundee, a distance of 88 miles 64 chains, involving three distinct climbs of 327 ft. (Cumbernauld), 133 ft. (Plean), and 422 ft. (Blackford) respectively, and a slack to 10 miles per hour through Perth. Leaving the Central station at 1.20 p.m., a stop was made at Coatbridge (11 miles 13 chains) from 1.35.30 till 1.36.1; Stirling (34 miles 52 chains) was passed at 2 exactly, and thence the initial 5 miles of the Dunblane bank were covered in 5 min.—this is partly at 1 in 73. The summit (50 miles 55 chains) was reached at 2.17, and the remaining 17 miles to Perth (falling to an altitude of 28 ft. at Hilton Junction) occupied only 13 min. 21 miles 10 chains of level road to Dundee accounted for 20 min., and No. 902 brought the special to rest in Dundee station at 2.50, after a very brilliant run of 90 min.

In the aggregate, the largest individual class of tender engines on the Caledonian is the No. 282 series of goods locomotives, their



0–4–4 PASSENGER TANK ENGINE (4 FT. 6 IN. CLASS).

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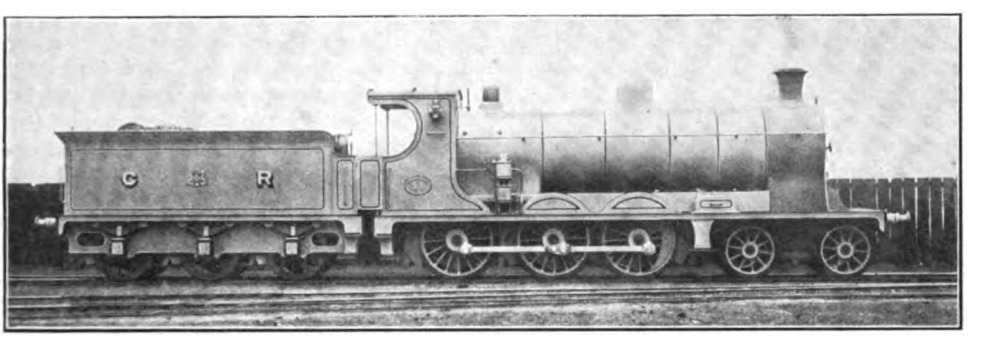
numbers appearing no less than 132 times between 282—the first—and 878—the last—of the series. These are handsome engines of the 0–6–0 type, with 5 ft. wheels, 18½ in. by 26 in. cylinders, a total heating surface of 1,403·23 sq. ft., and working pressure 160 lbs. per sq. in. They are utilised in the main for goods traffic, but a large number of them are employed in mineral working in the coal and iron districts of Lanarkshire, while Nos. 812 to 828 are engaged on the Clyde coast passenger trains between Glasgow and Wemyss Bay, a section which includes some heavy gradients near Greenock. In the season they are frequently called upon to manage loads of from 300 to 350 tons, and make excellent times, the fastest net booking for the 31 miles being 49 min. The tenders have capacity for 3,000 gallons of water and 4½ tons of coal; total weight in working order is 83 tons 10 cwt. and tractive force 17,790 lbs.

Drummond's engines, a new 0–8–0 series of mineral locomotives was introduced. This was the No. 600 class (Nos. 600 to 607), the first eight-coupled engines in Scotland. The spacing of the wheels is peculiar. The chief dimensions are: cylinders 21 in. by 26 in.; coupled wheels 4 ft. 6 in. diameter; heating surface 2,108 sq. ft.; grate area 23 sq. ft.; working pressure 165 lbs. per sq. in.; weight in working order (including tender with 3,570 gallons of water and 4½ tons of coal) 97¼ tons; and tractive force 26,276 lbs. The type was introduced to meet the demands of the then newly-introduced high-capacity mineral wagons, and these engines have proved themselves capable of taking, on the main line, 60 fully loaded vehicles and 20-ton brake-van. So lengthy, indeed, are many of the trains behind the 600 series that the question often is to find siding accommodation in which to place them. The principal mineral trains are nearly all run



SMALL WHEELED 4–6–0 ENGINE (5 FT. CLASS) No. 58.

A considerable number of passenger (0–4–4T) and goods (0–6–0T) engines were turned out from St. Rollox during 1897, 1898, and 1899. The former have 5 ft. 9 in. coupled wheels, and the latter 4 ft. 6 in., the cylinders are 18 in. by 26 in. Several are fitted with condensing apparatus for working over the Glasgow Underground lines, and these are painted black.

In 1901 and 1902 Mr. McIntosh re-built 11 of Mr. Drummond's No. 60 class—Nos. 60 to 70. These he practically converted into "Dunalastairs" of the first series, but the working pressure was increased to 175 lbs., and each was fitted with through-pipe and ejector for vacuum brake working, in addition to the usual Westinghouse fittings standard on the Caledonian. 1901 was a year of considerable activity in the locomotive construction department of the Caledonian. Besides the re-building of Mr. within a radius of 30 miles of Motherwell, but there are exceptions which go to Dundee, Perth, Edinburgh, etc.

In 1902 the first five of the new "Oban" bogies were constructed—"new" to distinguish them from the "old" engines of the same name built by Mr. G. Brittan prior to 1880. These were Nos. 55 to 59, and were the first 4–6–0 engines on the Caledonian Railway. In several respects they are of uncommon interest. The six-coupled wheels are only 5 ft. in diameter, which is peculiarly small for engines destined to engage in express passenger work. They are primarily intended, of course, for the Oban road, with its stiff gradients and mountain curves; but at such times as they have been given a wider field for their activities they have compared most favourably with all other types in service. They constitute the first British instance—possibly the first instance

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in the world—of the association in the 4–6–0 type of six-coupled wheels with inside cylinders only, the leading coupled wheels being directly driven. The principal dimensions are given separately in tabular form, together with those of other engines referred to. Further engines of this class, Nos. 51 to 54, were built in 1905.

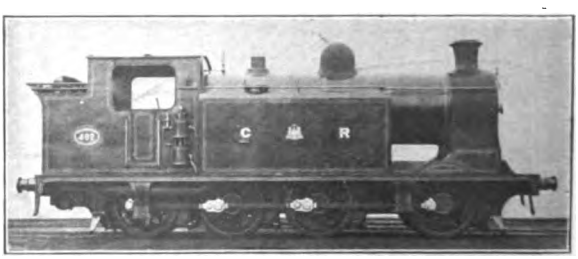
The immediate success of the "Oban bogies" led to the construction in the following year of the two great locomotives No. 49 and No. 50, *Sir James Thompson*, for the Carlisle road.

These did remarkable work for a long period, and in 1911 were partially re-built and fitted with Schmidt superheating apparatus, the working pressure being then reduced from 200 lbs. to 175 lbs., and with this appendage they continue to maintain the high standard of efficiency which they established in their earlier years. On account of their third pair of coupled wheels, their adhesion is some 15 tons greater than that of the largest of the Caledonian 4–4–0 engines, and this was such a telling factor in the climbing of the Beattock bank in unfavourable weather that surprise was frequently expressed, during the years intervening between their introduction and that of the 903 series of 1906, that Mr. McIntosh refrained from building supplementary locomotives of the same type with which to augment the tractive power on the Carlisle road. One reason for their non-appearance certainly was that prior to 1906 there were no turntables on the Caledonian large enough to accommodate engines of this class, so that when No. 49 or No. 50 reached Carlisle, engine and tender required to be uncoupled, turned individually, and thereafter recoupled, before it was possible to commence another run to the North. At Glasgow the conditions were similar, but the men at the running sheds were often enough relieved of the uncoupling business through the big engines being sent to work a local train from the Central round the Cathcart Circle Railway, tender first. The result was that when they arrived back in the terminus their position was reversed and correct for the journey South.

It was in 1903, also, that a new type of goods and mineral tank engine was introduced—the useful series 492–497. These are of the 0–8–0 class, with 19 in. by 26 in. cylinders, 4 ft. 6 in. coupled wheels, 1,189 sq. ft. of heating surface, 19·5 sq. ft. of grate area, and 175 lbs. per sq. in. working pressure. Their adhesion and tractive force (62 tons 16 cwt. and 22,813 lbs. respectively) are each the second largest in Scotland; they work at Motherwell, Hamilton, and Dundee, and as banking pilots.

In 1904 came the first of the No. 140 series of 4–4–0 engines—Nos. 140 to 144. These were succeeded by Nos. 145 to 150 in 1906, and are handsome locomotives with 19 in. by 26 in. cylinders and 6 ft. 6 in. coupled wheels. The total heating surface is 1,615 sq. ft., and the working pressure 180 lbs. per sq. in. In running order the weight of the engine is 54 tons 7 cwt 2 qrs., and of the tender 53 tons, while the tractive force is 17,320 lbs. The "Dunalastair IV." class, as the above are sometimes called, are a hard-working and highly efficient series of engines. Their best work is done with the postal expresses, especially with the 8.30 p.m. *ex*-Euston, which, north of Carlisle, runs under the appellation "Caledonian T.P.O. Night Down." Leaving Carlisle at 2.54 a.m., the Glasgow and Edinburgh coaches are dropped at Carstairs at 4.14, while the main train continues on the north road. At Stirling it makes a halt from 5.10 to 5.12, and, having attached passenger coaches from Glasgow Central, commences its run over the Dunblane bank to Perth, arriving in the General station at 5.53. Five minutes later it steams out on the only non-stop run of the day between Perth and Aberdeen, reaching the granite city at 7.35. The 240½ miles are thus covered at an average speed of 51·3 miles per hour—creditable work for every-day conditions over such a road, especially as this is inclusive of stops.

One of the most interesting points in connection with the history of modern locomotive practice is Mr. McIntosh's refusal to adopt the principle of the "Atlantic" locomotive, and thereafter work it out to



0–8–0 TANK ENGINE FOR HEAVY MINERAL TRAFFIC.

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suit his especial requirements. During the closing months of 1905 it was under consideration at St. Rollox whether or not it would be advisable to build a few 4–4–2 engines for exclusive use on the Perth and Aberdeen road, which would appear to offer considerable scope for this type; but if the project ever took definite shape, it fell through, for Mr. McIntosh could never reconcile himself to a principle which demanded the addition of 10 to 18 tons to the running weight of an engine, while the adhesion could not be appreciably increased. More power was required, however, and therefore, the turntable difficulty having been eliminated, Mr. McIntosh again turned to the 4–6–0 type to help him out, the trains having grown about 40 per cent. heavier on the introduction of the new "Grampian" passenger stock. The outcome was three new classes, all of them 4–6–0's.

The No. 903 "Cardean" class are well adapted for working over the difficult roads of the Caledonian. No. 903 herself has, for a long period, regularly worked south with the 2 p.m. dining car express *ex*-Glasgow Central, returning with the 8.13 p.m. *ex*-Carlisle—adhering strictly to time in all weathers with loads which occasionally exceed 400 tons. No. 907 similarly usually works the 10 a.m. up from Glasgow Central, and the other engines of the series have their standard duties, this being a policy in considerable favour on the Caledonian Railway. Some of the class also work on the Aberdeen road.

As in the case of the 903 class, the piston valves of the 908 series are situated above the cylinders, but while all the "Cardean" engines are now fitted with Schmidt superheaters, the principle has not yet been applied to any of the 5 ft. 9 in. locomotives —of which No. 909, *Sir James King*, and No. 911, *Barochan*, are members. The reason may be that the 908 series are largely employed on the short runs of the Clyde coast services. No 917 of this class is fitted with an American cab. A further series have, however, been constructed recently, intended mainly for express goods traffic, and these are fitted with Robinson superheaters, piston valves, closed-in cabs, and other improvements. No. 179 of this class was illustrated last month.

As regards the 918 series, these were constructed for fast, long-distance goods work, and have dual brake fittings. The cylinders are as large as is possible to retain the direct Stephenson link motion with valve chest between them, and, in common with all other Caledonian 4–6–0 types, the engines are driven off the leading axle. The safety-valves are of the double description now standard on the Caledonian, and have four valves, each 4 in. in diameter, and with independent springs. Apparatus is provided for sanding both the driving and the trailing wheels, which is particularly useful in any necessary shunting work. The principal services on which they run are between Carlisle, on the one hand, and Glasgow, Edinburgh, Greenock, Perth, Dundee, and Aberdeen, on the other. The longest journeys which they make unaided (leaving out of account banking assistance to Beattock summit, or from Buchanan Street to the top of the incline out of Glasgow) are from Carlisle to Dundee (172 miles); Edinburgh to Aberdeen (159 miles); and Glasgow to Aberdeen (153 miles).

In 1906 and 1907 a large series of 0–4–4 tank engines was introduced. These have 5 ft. 9 in. coupled wheels, and are doing excellent work on the local services in the Glasgow and Edinburgh districts, as well as on express work between Perth and Dundee, Crieff, etc.

In the summer of 1910 a superheater locomotive—the first in Scotland—was placed in regular service on the main line between Carlisle and Perth. This was No. 139, and already a large class has grown up round it—Nos. 117 to 122, 132 to 135, and 43 to 48—a few of these having the Robinson apparatus and the others the Schmidt design. To make any extended remarks relating to superheating on the Caledonian is hardly necessary. Suffice it to say that the practice has realised notable results. In external design the main differences between the 140 and the 117 series (superheaters) consist in the forward extension of the smoke-box, the steam cylinder for the superheater damper, the forced lubrication apparatus, and the separate springing of the axle-boxes on the tenders of the latter class.

In the superheater engines piston-valves are used, and their position above the cylinders rendered the employment of a rocking-shaft imperative. The mechanical lubrication is worked from the motion, and has eight feeds running to the cylinders and valves. The superheater damper in the smoke-box is controlled by a small cylinder and piston which receive steam on the opening of the regulator, and is so adjusted that it closes automatically

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when steam is shut off. The boiler pressure is 165 lbs. as compared with the 180 lbs. of the non-superheater engines. At a pressure of 160 lbs. the temperature of saturated steam is about 363° F., and to this is added 280° of superheat. Thus the temperature at which the steam enters the cylinders is from 640° to 670° F., it having been found that in practice only inconsiderable economies result when less than 200° of superheat is added to the saturation temperature, which, of course, varies in accordance with the boiler pressure. Mr. McIntosh states that owing to the decreased working pressure a very gratifying saving in the wear and tear of the boiler is being effected.

In 1912 four new 0–6–0 locomotives, forming a substantial supplement to the 282 series of goods engines, were turned out from St. Rollox, and these, together with a series of the 2–6–0 type—built a few months ago, and the first of their kind in Scotland—will be an important factor in the long-distance goods working of the company, for which duty they are primarily intended, although Nos. 30 and 31 are at present taking charge of local passenger trains in the Glasgow district. The 0–6–0 engines number inclusively 30 to 33, and the "Moguls" 34 to 38 (No. 37 was illustrated last month), and, apart from the addition of the leading pony truck and consequent alterations in adhesion and wheelbase on the latter, they are substantially similar. The superheater is of the Schmidt pattern, as are also the piston-valves, the position of which has again rendered necessary the use of the rocking shaft.

Recently superheaters of the Robinson pattern have been fitted to a few engines of the 766, 902 and other classes, in addition to the superheater equipments previously referred to.

In conclusion, it will be seen that Mr. McIntosh will leave behind him a record of things achieved which will long be remembered in the annals of locomotive practice and enterprise. The years during which he has been Superintendent at St. Rollox have been years of striking advance in the mechanical side of railway engineering in Great Britain. He has always seen to it that the Caledonian retained its position in the forefront, and has displayed wonderful discrimination in his choice of labour-saving and fuel-economising devices. He has succeeded, too, in not only maintaining but also in adding to the gracefulness of design which has always been characteristic of Caledonian construction, and his retirement will mean the loss of one who has served his own and future generations faithfully and well. The up-to-date methods of the locomotive department will long be associated with his name; it is satisfactory to know that his opportunity came at a time when a strong man was needed to supply haulage power for the traffic increases which marked the concluding years of the nineteenth century. At the present time the daily average of locomotives in active service numbers about 1,050, the aggregate tractive force of which is approximately 15,000,000 lbs., while the miles run per annum total thirty millions.

In the coming struggle for supremacy between electricity and internal combustion on the one hand, and steam on the other, the steam engine may, after a lapse of time, begin to give place to other means of long-distance traction. But whatever may be the issue, the McIntosh locomotives will always be remembered as among the most successful engines in service, and one feels justified in saying that it will be many years before such splendid machines will be called upon to take a secondary place.

Mr. McIntosh joined the then Scottish North Eastern Railway at Arbroath in 1862, and after duly qualifying in the mechanical as well as in the locomotive running departments, was appointed Locomotive Inspector of the Northern Section of the Caledonian Railway in 1876. Six years later he was made District Locomotive Foreman at Aberdeen, from which he was subsequently promoted to Carstairs Junction, and eventually was put in charge of the Company's most important engine shed at Polmadie. After remaining there for five years he was appointed Chief Inspector of the Running Department in 1891, and took up his present duties as Locomotive, Carriage and Wagon Superintendent in February, 1895. Mr. McIntosh was President of the Association of Locomotive Engineers in 1911. In October of the same year His Majesty King George honoured Mr. McIntosh by creating him a Member of the Royal Victorian Order, and on the occasion of the last royal train journey a few months ago Mr. McIntosh, in obedience to a "command," attended at the Royal Saloon, where His Majesty in hearty fashion wished him good-bye.

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Modern Carriage Stock: North Eastern Railway.

IN extension of Mr. Basil Mercer's articles on "Passenger Carriages of British Railways" the following description of modern practice in railway carriage construction on the North Eastern Railway will be of interest.

Standard third class carriages employed for main line and local service usually have an overall length of 49 ft. with eight compartments. The roof is semi-elliptical, the outer skin being composed of $\frac{7}{8}$ in. boards, supported by steel angle roofsticks and ash sweeps. Seats and backs are of the spring frame pattern, covered in red and black rep, accommodating five passengers aside. The finish is plain, neat and hygienic. Above the seat back is arranged on one side a series of typical photographs of North Eastern scenery, with the usual hotel notices, while opposite is placed a rectangular bevel-edged mirror. The steam heating control handle is located midway between the photos, while the torpedo ventilator is operated by a similar handle on the opposite side, connected to the ventilator valve by a Bowden wire. The roof is in plain millboard, painted white, the semi-elliptical curve and the space over the door and quarter lights being in the same colour. Transverse net rods and brackets for light luggage are fixed well up the partitions.

Doors are arranged with falling lights, with the usual fence plate, while the garnish rail and draught excluder are hinged. Above the window, "hit-and-miss" ventilator shutters are placed, with the spring blind in tapestry, housed immediately below. Kaye's patent inside slam locks with double tongues are standard to these coaches. Lighting is electric, on Stone's latest system.

A non-storage steam heater, consisting of a 2 in. steam pipe, is placed below one seat, and, as stated, is regulated by a handle above the seat back; this operates a small patent steam cock with slide valve, admitting or shutting off steam obtained from the main $1\frac{1}{2}$ in. pipe, located below the body floor. A drip valve at the opposite end takes off all condensed moisture. The body is constructed of teak and oak framing, with baywood panelling throughout, heavily blocked and canvassed. The partitions are built of horizontal and vertical boarding $1\frac{1}{4}$ in. thick, while all the facias are of painted baywood. The underframe is constructed of steel channel sections. Buffers have indiarubber springs, and project 1 ft. 10 in. The drawgear in the particular coaches illustrated is of the self-contained type and pulls on rubber springs behind the bolster. Attached to the underframe is the Westinghouse brake, consisting of a standard 12 in. single-piston Westinghouse cylinder, improved $3\frac{1}{2}$ in. triple valve, 1 in. air pipe, with the usual couplings and hosepipes. Bogies are built up entirely of pressed steel. Bearing springs are of the laminated pattern, 5 ft. span, and smooth running is further obtained by the use of rubber auxiliaries. The bolster springs are of Timmis patent double web section. Clasp brakes acting on both sides of all wheels are arranged to give a total leverage of 4 to 1. Wheels are Kitson's patent cushioned type, the centres being of the corrugated rolled-iron pattern, with a teak cushion between the tyre and centre, flat keys being arranged to prevent independent rotating movement of the two. Tyres are 3 in. thick. Axles have 9 in. by 4 in. journals, on 6 ft. 6 in. centres, and the latter run in oil axleboxes with spring pad lubrication. Screw couplings with steel screws and trunions, are fitted to the drawhook at both ends. Passenger communication, connected to the Westinghouse brake system, is fitted to all carriages. The coaches are finished in the standard lake colour, the roofs being left the natural canvas colour. Underframes and bogies, steps and ironwork are dead black.

The ordinary lavatory composite carriages are 52 ft. long, with both full and semi-compartments. The finish of the third class

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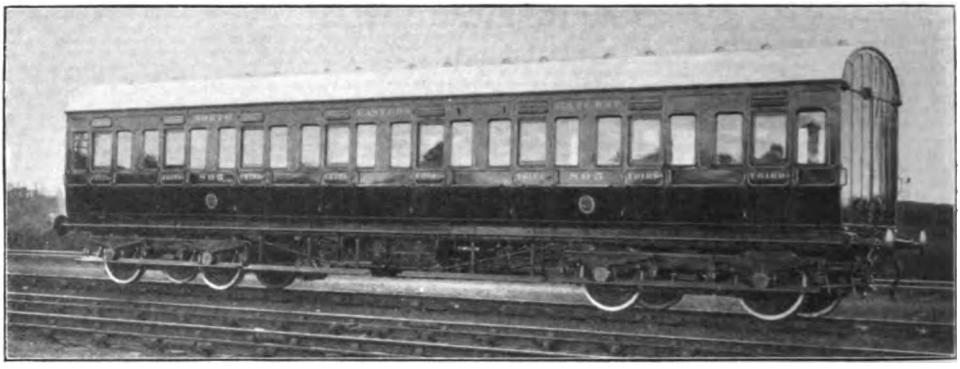
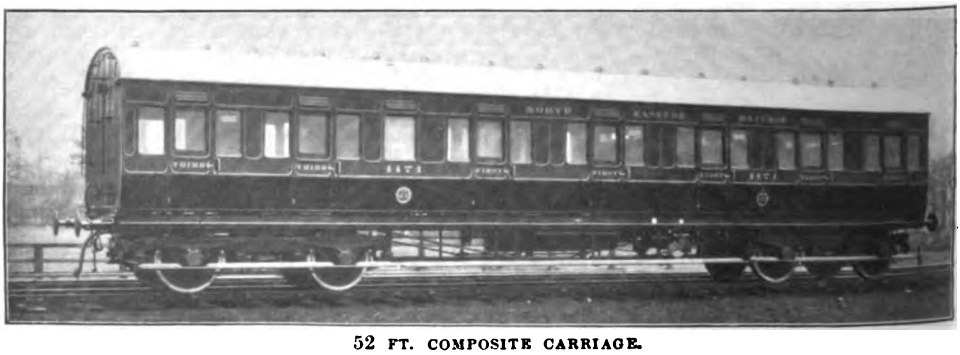


49 FT. BOGIE THIRD CLASS CARRIAGE.

is as already described. The small semi-compartments have sliding doors, attached to which are Crittals patent roller bearings and runners. The lavatories are finished in high-class hygienic and sanitary material. Roof and sides are painted dead white, while the floors are laid with cement and mosaic tiling in small black and white pieces. A large flushing plug is let into the floor, so that they may be thoroughly cleansed by water. The W.C. is of Beresford's water seal pattern. Hot and cold water supplies are controlled by a special valve. The lavatories are lighted by obscured glass windows with ventilators above. The first class compartments are upholstered in blue cloth, the seats being of the well-known "Marshall's" sanitary pattern. The backs are also arranged on curved spring frames. All first class compartments now have the arm rests arranged to fit flush into the backs, when not in use. The mahogany cabinet work is on simple lines, harmonising with the general colour finish. In the first class compartments are arranged two heater pipes, so that three distinct stages of temperature may be obtained. The underframe, running gear and fittings are similar to the 49 ft. vehicle already described. Gas lighting of the incandescent gas type is usually fitted, although later-built coaches are illuminated by electricity, Stone's latest system and accumulators being installed. Both Westinghouse and Vacuum brakes, for interchange working, are sometimes fitted.

Six-wheeled brake vans of the class illustrated are 32 ft. over ends and 8 ft. 6 in. wide. The body is constructed throughout of teak, oak framing and baywood panels, with inside sheeting of plain wood. Natural light is obtained from fixed glasses below the cant rails, end windows, and two roof sky lights. Ventilation is obtained from 4 in. torpedoes, arranged in the centre of the roof. Two pairs of folding doors and a guard's door, opening inwards, are arranged. Guards duckets project 3 in. beyond the body sides, and are fitted with glasses at both ends. Provision is also made for carefully accommodating insured parcels, while the usual hand brake, pressure gauges, Westinghouse and Vacuum release valves, and other fittings are arranged within the interior. The underframe is of steel throughout, and built of 10 in. and 6 in. longitudinal channels. Only the two outside sets of wheels are braked. Both West-



52 FT. COMPOSITE CARRIAGE.

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53 FT. 6 IN. FIRST CLASS DINING SALOON.

inghouse and Vacuum brake cylinders are included in the equipment, as are also the main pipes, steam pipes, end hoses and couplings. Drawgear is of rubber, non-continuous. Buffers are similar to those employed for the bogie carriages. Wheels are of the standard type, carried on axles having 8 in. by 4 in. journals. Many of these vans are arranged with special fold up shelves for conveying homing pigeons, sent by the Northern Federations to various liberating places.

First and third class dining cars are arranged on the open saloon principle, with a continuous aisle between the tables. In length, width and height they are alike, while the underframes, bogies and wheels are also interchangeable. Each vehicle is 53 ft. 6in. over body, 9 ft. wide over mouldings, and 12 ft. 10 in. from rail level to extreme of torpedoes on roof. Underframes are built of standard steel sections, well braced and stiffened by diagonal members and crossbars. The solebars are trussed. Dual power brakes on the Vacuum and Westinghouse principles are installed, while the dynamo and accumulators for Stone's electric lighting system are also accommodated on the underframe. The bogies are of the well known Leeds Forge pattern, having a wheelbase of 8 ft. Wheels are 3 ft. 6 in. diameter with 3 in. steel tyres and rolled mild steel centres. The axles have journals 9 in. by 4 in. on 6 ft. 6 in. centres. Messrs A. G. Spencer's patent concentric rubber springs constitute the buffing and drawgear medium. British standard gangways are fitted at both ends of the vehicles, so that through communication may be established with other Companies' stock.

The interior of the first class car has a flat, but extremely tasteful decorative scheme in polished walnut, while the doors, seat

53 FT. 6 IN. OPEN THIRD CLASS SALOON.

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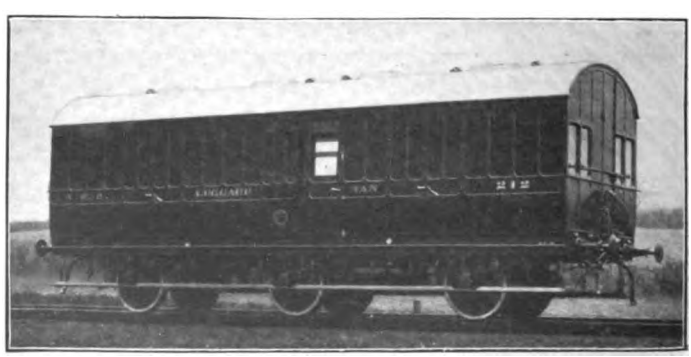
ends and panels between and over the windows are enriched by delicate inlays of ebony and boxwood. Seats are arranged to seat two and one, in a transverse plane, and the ends are so designed that kit bags, golf clubs, etc., may be stored below. The upholstering of the seats is in dark navy blue box cloth, while the arm rests are covered snuff brown. Axminster carpets of harmonious design and colouring are laid on felt, the floors being so designed as to provide the minimum of vibration and sound. The side windows are of the fixed type, and Mead, McLean and Co.'s patent louvre ventilators are fitted over certain of these to give efficient ventilation. These ventilators have proved very beneficial from a ventilating point of view, and are highly approved of by the general public.

Spring blinds and dust curtains are also fitted at each window, while handsome commodious parcel racks are arranged between each window, and on each partition. Half tone photographs illustrating historic and picturesque places on the North Eastern system are mounted in each end partition. The roofs and ceilings are of the semi-elliptical form, and the latter is finished in white enamelled lincrusta with handsome borders.

Five-light electroliers in oxydised silver depend from the ceilings, in addition to which each table is provided with a massive portable stand lamp. The ceiling ventilation valves are worked by wires and handles at the body side, so that passengers have these directly under their own control. All the fittings in the first-class cars are in oxydised silver. Spacious lavatory accommodation has been provided, with hot and cold water, and Beresford's water seal W.C. The floors of the lavatories are covered with tiles, the walls being covered with Emdeca dado with white painted millboard above. All the corners being round makes this compartment very easy and accessible for cleaning.

Third class cars are very similar in arrangement to the firsts already described, as will be seen from the photographs. The finish is in plain mahogany, and seat covering in black and red rep, the seat ends and general decoration being of more subdued and less ornate nature, while the fittings are in brass. Insulated floors, with durable and pleasing carpets are also fitted in these coaches. Vehicles of both classes are fitted with a very efficient arrangement of electric fans and attendant's bells, the fans being worked off the lighting system, while the heating is on the non-storage plan, taking steam from the locomotive. These vehicles have doors at the ends only, so that when a full set is assembled the absence of intermediate doors greatly enhances the general appearance of the whole train.

We are indebted to Mr. Vincent L. Raven, Chief Mechanical Engineer, for the above particulars, and the photographs reproduced.



32 FT. SIX-WHEELED VAN.

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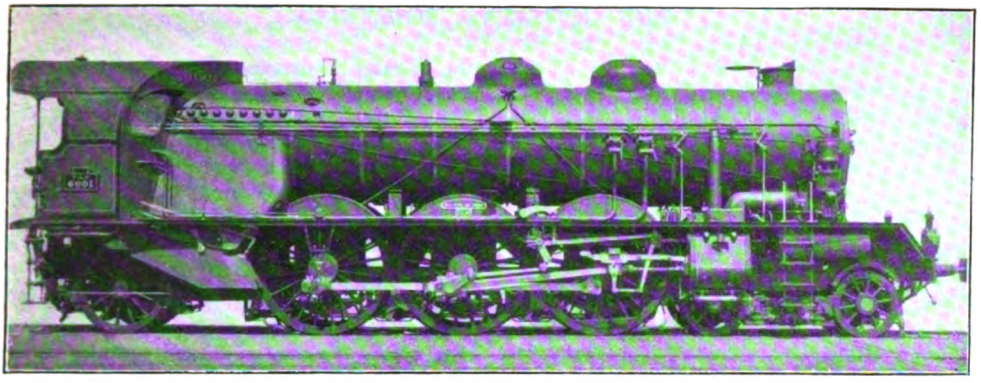

FOUR-CYLINDER COMPOUND LOCOMOTIVE: PARIS, LYONS AND MEDITERRANEAN RAILWAY.

French "Pacific" Locomotives and their Work.

By HUMPHREY BAKER.

ALTHOUGH in the United Kingdom Great Western Railway engine No. 111 is still the only tender locomotive with the 4–6–2 type of wheel arrangement, on the Continent engines of this class are numerous and much important express work is done by them. France may be taken as an example of modern European practice in this respect. Pacific locomotives are in use in France on the Nord, P.L.M., Midi, Paris-Orleans, and State Railways. The chief dimensions of some typical classes are given in the table on the next page. Dimensions of Great Western Railway No. 111 are added for comparison.

It will be seen that there is much similarity as to essential features between the different designs. Four compound cylinders, large heating surface, very large grate area, high working pressure, and some 53 tons adhesion weight, are usually included. The Nord example is considerably the smallest, notwithstanding the remarkable speeds for which that line is so well known. Perhaps the most interesting point in the dimensions is the grate area. In a discussion as to the relative merits of the 4–4–0, 4–4–2 and 4–6–0 types, the late Mr. Rous-Marten once decided against the 4–4–2, arguing that if an extra pair of trailing wheels were added, it was a pity to waste the weight which rested on them by making them merely carrying wheels—better couple them to the driving wheels, and so gain weight for adhesion. Thus he concluded that the 4–4–0 and 4–6–0 types would become standard, while the 4–4–2 would drop out, as being neither the one thing nor the other. He rather inconsistently went on to forecast the introduction of the 4–6–2 type as an improvement on the 4–6–0, though the arguments against the idle carrying wheels under the firebox have exactly the same force in this case as in the other. The truth is, that the small trailing wheel does give the great advantage in both cases, that the width of the firebox is not limited by large driving wheels on either side, and that consequently a large grate area can be got without an unmanageably long firebox. In the above designs full use is made of this advantage, and the grate area bears a much higher proportion to the other dimensions than it usually does in the 4–6–0 type. Thus the Great Western Railway four-cylinder 4–6–0 engines, which have an adhesion weight of 55 tons loaded, have only 27 sq. ft. of grate, and the new 4–6–0 locomotives of the Great Central, with 2,816 sq. ft. of heating surface, have only 26. If a large grate area is desirable (and it seems to be the common opinion that it is), this point in the 4–6–2 type deserves close attention. It should be observed in passing that though there are several types of 4–6–2 *tank* engines in the British Isles, yet as regards the question of grate area they are not comparable, since their trailing wheels are not under the firebox, but under

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Railway.	Nord.	P.L.M.*	Midi.	Paris-Orleans.	State (Ouest).	State.	G.W.R.
Cylinders—H.P.	16⅜ × 26⅜	15¾ × 25⅝	15¾ × 25⅝	15⅜ × 25½	15¾ × 25¼	15 × 25¼	15 × 26
L.P.	23⅝	24½	24⅛	25¼	26	26¼	
Driving wheels	6 ft. 8½ in.	6 ft. 6⅝ in.	6 ft. 4½ in.	6 ft. 0¾ in.	6 ft. 4½ in.	6 ft. 1 in.	6 ft. 8½ in.
Heating surface, sq. ft.	2327 (with superheater)	3044	2309 (with superheater)	2769	3046	3190	3401 (with superheater)
Grate area, sq. ft.	33·9	45·7	43	46	43	45·3	41·9
Working pressure	227	227	227	227	235	227	225
Weight of engine, loaded —Total	85	93¾	90	89	90½	80†	96
Adhesion	49¾	54¾	53⅜	53	53½	52†	60

* The P.L.M. has also a four-cylinder simple superheater type, with cylinders 18¾ in. in diameter and a working pressure of 171 lbs.; the other dimensions are practically the same as those of the compounds.
† Weight empty.

the bunker, corresponding to the tender wheels of a tender engine.

This brief survey of dimensions may be followed by a few specimens of work done in France by engines of the 4–6–2 type. Three runs on the Nord by the 9.50 a.m. from Paris to Calais were all good, but varied in detail. The train is not, of course, by any means the fastest on the line; but the running is generally better over a large part of the journey than the schedule requires, and the booked average speed of 56·8 for the 184·7 miles includes a 3 or 4 min. stop at Abbeville for water, and is much lowered by the compulsory crawl from Calais Ville to Calais Pier, a distance of 1·6 miles which, on one of the runs, took nearly 6 min. On the first run (the least interesting, perhaps, of the three), the load was about 310 tons. Sixty miles per hour was attained on level or falling grades in 2½ miles from the start, and the first 5 miles were run in 7 min. 2 sec. The 11·8 miles up the bank at 1 in 200 from post 8 to post 27 took 12 min. 1 sec., an average of 58·9, the slowest kilometre being run at 57, and the 16·8 miles from Paris to the summit were run in 19 min. 3 sec. This ascent may usefully be compared with that from King's Cross to Potters Bar; though the start is easier, the distance is 4 miles greater. Down the following bank at 1 in 200 from post 28 to post 48 steam was shut off at intervals, and the legal maximum of 74·5 was barely exceeded. Post 48, 29·8 miles out, was passed in 30 min. 19 sec. Then came the slight slack for the junction at Creil, and the long though broken ascent to post 86. This climb was taken more easily, as the back of the work was already broken, and the summit, 53·4 miles from Paris, was reached in 55 min. 10 sec. Down the long succeeding fall towards Amiens the speed was again moderate, but 73·9 miles from Paris took only 73 min. 15 sec. A permanent way check followed, and the slack to 30 through Amiens (81·1 miles in 81 min. 23 sec.). An average of 66·1 for 20½ miles of level beyond Amiens brought us to the stop at Abbeville, 109 miles, in 109 min. 30 sec. The rest of the run to Calais was uneventful, but the 183·1 miles to Calais Ville were run, deducting the time spent standing at Abbeville, in 189 min. 21 sec.

On the second run the load was a little lighter—about 300 tons. The speed in 2½ miles from the start was 63·1, the first 5 miles were run in 6 min. 50 sec., and the 11·8 miles up the bank took 11 min. 44 sec., an average of 60·4. The slowest kilometre was

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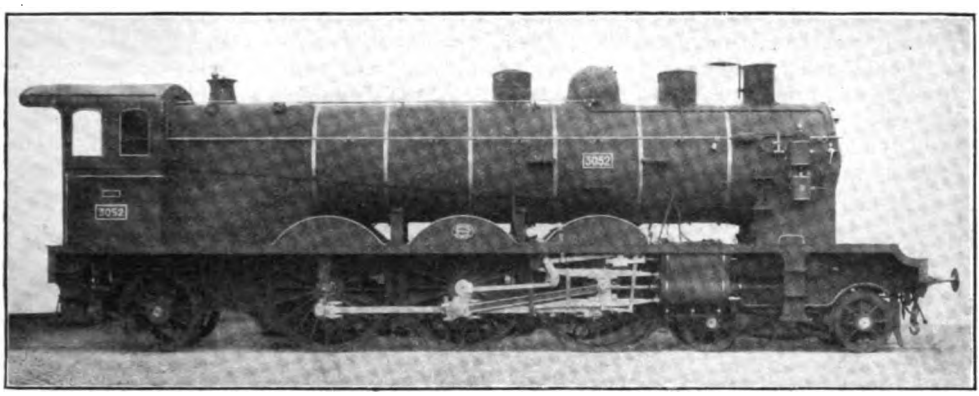
run at 57·3 and the summit was passed in 18 min. 34 sec. from Paris. The writer's nearest approach to such a speed up a similar bank in England is an average of 62·3 up the 6 miles at 1 in 222 between Lavington and Patney on the Great Western ; but the bank is shorter and easier, and the load was only 165 tons. This remarkable ascent was followed by a maximum of 76·5 down the other side, and the 23·6 miles from Paris to post 38 were run in 24 min. 29 sec. After this, however, two permanent way checks and an unusually careful slow through Creil made the run to Amiens take 83 min. 37 sec. from the start. But this was followed by an average of 69·6 for 16·8 miles of level, and Abbeville was thus reached in 110 min. 29 sec. Starting afresh and in good time, the train had no need to hurry but for a sudden stop in mid-country at post 186 and a subsequent permanent way slack. Up the 3 miles to post 86 was more vigorously attacked, and the 19·9 miles from post 54 to post 86 were covered in 20 min. 15 sec. Afterwards the speed on the down grades averaged 71·6 for 33 kilometres, so that Amiens was passed in exactly 81 min., and Abbeville reached in 109 min. 8 sec. for the 109 miles. The rest of the run was uneventful, but Calais Ville was passed in 188 min. 3 sec. running time from Paris.

All these runs are sufficiently remarkable ; but what struck one most at the time was, first and foremost, the very quick acceleration from rest or from a slack, and only second to this, the sustained high speed up adverse gradients. On these runs, up the 1 in 200 gradient, the speed soon fell to its lowest, and remained at that the rest of the way, or even increased. In none of the instances was the last kilometre the slowest. Up the Caffiers bank at 1 in 125 it is true that



FOUR-CYLINDER COMPOUND 4–3–2 LOCOMOTIVE (SCHMIDT SUPERHEATER) : MIDI RAILWAY.

of 1 in 140 to post 238 the last kilometre was run at 46.5, and a maximum of 77.1 was reached down the other side ; and on the much more severe Caffiers bank, rising at 1 in 125 for 10 kilometres to near post 278, the last kilometre wholly on the bank was run at 44·5, and these 6·2 miles took only 7 min. 9 sec. A maximum of 78·7 followed on the corresponding fall, and Calais Pier was reached in 82 min. 21 sec. running time from Abbeville, 75¾ miles. The run from Paris to passing Calais Ville took 188 min. 58 sec. running time for the 183·1 miles, in spite of four permanent way slacks of varying severity, three service slacks, and two stops.

The third run was made with a heavier load—about 355 tons. The start was naturally slower, but nevertheless the speed in 2½ miles was 60·4, and the average up the 1 in 200 was 56·2. After Creil the long rise the speed was still falling at the top ; but the bank is shorter and steeper, and is approached at a higher speed. As for acceleration, to attain 60 miles per hour with a load of 355 tons in 2½ miles from the start is a thing one does not often meet with in this country ; and it was quick recovery from slacks which enabled time to be kept on the second of the three runs.

But a much more remarkable instance of acceleration is supplied by the following run, made on the P.L.M. afternoon express from Pontarlier to Paris, between Mouchard and Dijon. The line between these points, 48·4 miles apart, crosses a wide plain from one range of hills to another. The gradients fall for some distance from either end of the section, and undulate in the middle, the first 3 miles from the Mouchard start being on a descending gradient of 1 in 101. There are

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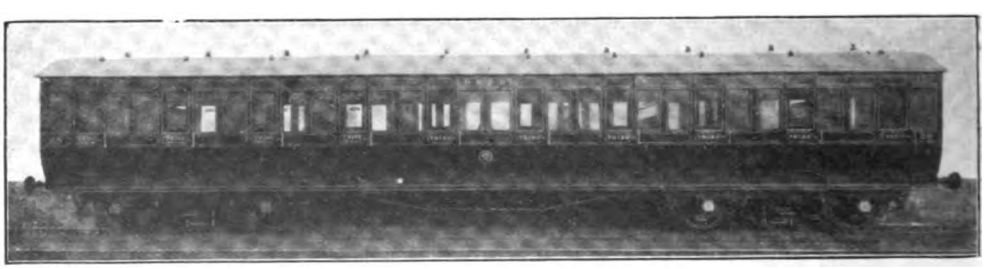
few curves, and though the schedules are slow, it is a splendid stretch for making up time. The train in question is booked to leave Mouchard at 5.27 p.m., to stop at Dôle, 19·7 miles, in 26 min., and to take 41 min. for the remaining 28·7 miles to Dijon. The load was 375–380 tons from Mouchard to Dôle, and 410–415 beyond. With the lighter load a speed of 61·1 was attained in 1·7 miles from Mouchard, and a speed of 72·1 in 2·9 miles. The first 5·1 miles were run in 6 min. 34 sec., and the first 17·5 in 17 min. 46 sec. At Dôle the stop was very cautious, so that the start-to-stop run took 21 min. 42 sec.; but, in spite of the falling gradient, the start was undoubtedly remarkable with such a load. The subsequent run to Dijon begins with a short rise, so that speed was not gained quite so rapidly; but even so, and with the 35 tons extra load, in 3·1 miles the speed was 62·4, in 4·9 miles it was 70·3, and the first 16·4 miles were run in 17 min. 57 sec. The rest of the run was spoiled by an excessively bad slack; but a point 36·2 miles from the Mouchard start was reached in 39 min. 39 sec. running time, with an intermediate stop, and an average load of nearly 400 tons. The maximum speed—73 for one kilometre—was not exceptional; the fast average was entirely due to the power of the engine to gain speed quickly with the heavy load.

An experience with another train over the same stretch of line in the opposite direction is also worth recording, though made with a much lighter load. The morning express from Paris to Pontarlier and beyond is timed to leave Dijon at 12.57 p.m. and to take 59 minutes running time thence to Mouchard, 48.4 miles, with an intermediate stop at Dole. The start was 19 minutes late, and the load 230 tons to Dole and 194 beyond. There is a service slack about a mile out from Dijon; nevertheless, the 28·7 miles to Dole were run in 29 min. 12 sec. start to stop (24 kilometres being run at an average of 71·6), and the following 19·7 miles to Mouchard in 20 min. 38 sec., in spite of the final rise at 1 in 101, and a slack just before the stop. Thus the whole run of 48.4 miles was made in 49 min. 50 sec. running time, with an intermediate stop; and in this short distance 9 minutes were gained on the schedule.

These instances are few, but they are enough to show the kind of work of which these locomotives are capable, and it is safe to say that it would be hard to beat.

New 10-Compartment Third-Class Carriage: Dublin and South Eastern Railway.



Although the Dublin and South Eastern Railway is a relatively small system, Mr. Cronin, Locomotive, Carriage and Wagon Superintendent, has carried out a great deal of interesting rolling stock construction at the railway works in Upper Grand Canal Street, Dublin, affecting both locomotives and passenger and goods vehicles; and we now illustrate a ten-compartment third-class bogie carriage recently built for use on the boat train service between Dublin and Kingstown in connection with the Holyhead and cross-Channel traffic. The body is 58 ft. long, while the latitude afforded by the Irish gauge has permitted a width of 9 ft. 6 in. The height from floor of carriage to centre of roof is 8 ft. A steel underframe is employed, with four-wheeled bogies of 10 ft. wheelbase. Steam-heating apparatus is fitted.

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British Locomotive Practice and Performance.

By
CECIL J. ALLEN.

Photo] [*F. J. Curtis.*

GREAT WESTERN RAILWAY.

3.15 p.m. Paddington-Cheltenham express. 4–6–0 locomotive No. 2980 *Coeur-de-Lion.*

THREE years ago, in the RAILWAY MAGAZINE for March, 1911, I gave a comprehensive table showing leading dimensions of 45 different express locomotive designs used in the British Isles. Together with these particulars, the proportions of certain dimensions to others—as, for example, the ratio of cylinder volume to boiler heating surface—were worked out in every case, and on these dimensions and proportions as a basis I initiated a discussion on the general lines of locomotive constructional practice which continued for many months. Locomotive superheating in this country was then in its infancy, and, strange though it may seem, only three out of the 45 types dealt with were fitted at that time with superheating apparatus. In the three years that have elapsed, however, a revolution has taken place in this direction, and the latest express locomotive types of every company represented in that table are, almost without exception, superheater-fitted engines. Consequently, on the suggestion of a correspondent, I have compiled a fresh table on similar lines, in order to have some material to "work on" in future months, the principal feature of which is that all the engines dealt with are equipped with superheaters. There will also be this difference—that whereas the previous table appeared in undivided form, covering two complete pages with a somewhat staggering profusion of figures, it is my intention this time to present it in small sections, so that the immediate basis of discussion may be before readers without the necessity for reference to past issues of the RAILWAY MAGAZINE.

A word or two may first be said as to the types of engines represented. In the previous table five wheel arrangements were considered—4–6–2, 4–6–0, 4–4–2, 4–4–0 and 4–2–2. I believe that certain of the reboilered 4–2–2 engines on the Great Western Railway have, in conformity with current Swindon practice, been fitted with superheaters, but so far as I am aware no modification of cylinder or other dimensions has been made. The 4–2–2 wheel arrangement is therefore not included in the new tables. For a similar reason several other well-known locomotive types, some of which have been recently equipped with superheaters, do not now appear, as I wish to confine attention as far as possible to engines which have been specially designed with a view to the employment of the principle of superheat. This will explain the absence of the 4–4–0 R and R1 classes on the North Eastern Railway, a number of which are now fitted with either Robinson or Schmidt superheaters, as also the experimental 4–4–0 superheater engines of the Great Eastern and South Eastern and Chatham Railways. Certain modern "mammoths," which do not boast of superheater equipment, will also be missed, as the 4–4–2 and the four-cylinder 4–6–0 engines of the Lancashire and Yorkshire Railway, the 4–4–2 engines of the North British Railway, and others. Conversely, the scope of the table has been widened to include recent notable superheater designs intended for mixed traffic service, of both the 4–6–0 and the 2–6–0 wheel arrangements, and also a number of modern superheater tank engines, having the 4–6–4, 4–6–2, 2–6–2, 4–4–4, 4–4–2 and 2–4–2 wheel arrangements, all of which make their appearance at times on express or semi-fast passenger service. Four types of superheaters appear in the table—the Schmidt on 26 of the 45 engines, the

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Robinson 9, the Swindon on 8 (all Great Western), and the Drummond on 3. A description of these superheaters was given in these columns as recently as July last, and the details need not therefore be recapitulated; it is sufficient at this point to say that the two first-mentioned afford high superheat, the Swindon pattern moderate superheat, while the Drummond apparatus, which is located in the smoke-box, is really a steam-drier only.

As in the previous table, the first matter for consideration is that of cylinder dimensions. The volume represents the aggregate cylinder dimensions, more particularly in the matter of diameter, which is distinctly traceable to the employment of superheaters. As is well known, the use of superheated steam allows of a greater range of steam expansion in the cylinders without fear of condensation, while in other cases enlargement is made to provide for a given nominal tractive effort with reduced steam pressure. Thus in the case of virtually all the locomotives which are superheater modifications of previous designs, this property has been met by an increase of from ½ to as much as 1½ in. in cylinder diameter, while

SIX-COUPLED ENGINES.

Type.	Typical Engine. Railway.	No.	Name or Class.	Superheater Employed.	Cylinders. No.	Dia. ins.	St'ke. ins.	Vol. cub ft.
4–6–2	G.W.R. ..	111	*The Great Bear*	Swindon	4	15	26	10.65
4–6–0	Caledonian R. ..	903	*Cardean*	Schmidt	2	20¾	26	10.19
	G. & S.W.R. ..	129		,,	2	21	26	10.43
	G.C.R.	423	*Sir Sam Fay*	Robinson	2	21½	26	10.94
	G.E.R.	1500		Schmidt	2	20	28	10.19
	G.W.R. ..	4041	*Prince of Wales*	Swindon	4	15	26	10.65
	,,	2934	*Butleigh Court*	,,	2	18½	30	9.34
	L. & N.W.R. ..	2222	*Sir Gilbert Claughton* ..	Schmidt	4	16	26	12.11
	,,	819	*Prince of Wales*	,,	2	20½	26	9.94
	L. & S.W.R. ..	447	(6 ft. 7 in class)	Drummond	4	15	26	10.65
4–6–0M	Caledonian R. ..	179	(5 ft. 9 in. class)	Robinson	2	19½	26	9.00
	G.C.R.	4	*Glenalmond*	Robinson	2	21½	26	10.94
	L. & S.W.R. ..	482	(6 ft. class)	*Schmidt	2	21	28	11.24
	N.E.R.	782	Class S2	Robinson	2	20	26	9.46
2–6–0M	Caledonian R. ..	37		Schmidt	2	19½	26	9.00
	G.N.R.	1630	(Class H2)	,,	2	20	26	9.46
	G.W.R. ..	4331		Swindon	2	18½	30	9.34
	L.B. & S.C.R.	337		Robinson	2	21	26	10.43
4–6–4T	Mid. (L.T.S.) R.	2100		Schmidt	2	20	26	9.46
4–6–2T	G.C.R.	165		Robinson	2	20	26	9.46
	L. & N.W.R. ..	2667		Schmidt	2	20½	26	9.94
	L.B. & S.C.R. ..	326	*Bessborough*	,,	2	21	26	10.43
2–6–2T	G.W.R. ..	3121	(5 ft. 8 in. class)	Swindon	2	18	30	8.84

M Mixed Traffic Locomotives.
T Tank Locomotives.
* Certain of these engines are fitted with the Robinson superheater.

for the two, three or four cylinders, as the case may be, and is, of course, nominal volume only. It is calculated by multiplying the area of the pistons by the stroke, and thus does not represent the total cubical content of the cylinders, as the space occupied by the pistons themselves is not taken into account; but this is the nominal figure employed in calculating the theoretical tractive effort. In comparison with the table of three years ago, the first matter for comment is the striking increase in general dimensions have remained almost unaltered. Whereas, therefore, the commonest cylinder diameter of express locomotive types in this country prior to the introduction of superheating was 19 in., it is now more generally 20 in., 20½ in., or 21 in., 12 engines boasting the first-named diameter, 6 the second and 5 the third, while the Caledonian Railway, which appears to revel in ¼ in. dimensions, employs a diameter of 20¼ in 4–4–0 and 20¾ in. in 4–6–0 express engines.

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The largest cylinder diameter at present employed in this country is one of 21½ in., which is used on the Great Central Railway in both the new "Sir Sam Fay" and "Glenalmond" superheater 4–6–0 type engines. Curiously enough these cylinders are placed between the frames, instead of outside them, but they are soon to be exceeded in their dimensions by those of the forthcoming 4–6–4 London, Brighton and South Coast Railway express tank engines which are, if rumour be correct, to be equipped with outside cylinders of no less than 22 in. diameter. At the other end of the scale we have the 19½ in. cylinder diameter of the Caledonian 4–6–0 and 2–6–0 engines, and of the Drummond 4–4–0 engines on the London and South Western and the Glasgow and South Western Railways; the 19 in. of the Irish Great Northern Railway 4–4–0 engine; the 18½ in. of the similar type on the English Great Northern Railway and of the Great Western 2–6–0 and two-cylinder 4–6–0 classes; and the 18 in. of three further Great Western Railway locomotive types. Multi-cylinder arrangements occasion a reduction in diameter to 16 in. in the case of the London and North Western four-cylinder engines, and 15 in. in that of the latest London and South Western and Great Western four-cylinder 4–6–0 types. The late Mr. D. Drummond's earlier 4–6–0 engines had cylinders of 16 in. diameter, as have also the non-superheater 4–6–0 engines of the Lancashire and Yorkshire Railway, but, on the contrary, the previous standard diameter for four-cylinder 4–6–0 engines on the Great Western Railway has been 14¼ in. The three-cylinder arrangement employed on the North Eastern Railway is responsible for a cylinder diameter of 16½ in., the three cylinders being equivalent in piston area to two cylinders of 20¼ in. diameter.

In the matter of stroke but few changes have taken place. By far the most popular length is still 26 in., which has been adopted in no less than 37 of the 45 cases tabulated, and is equally serviceable for both inside and outside cylinder arrangements. The longest stroke employed is still the 30 in. of the Great Western Railway, and this is used freely on all outside two-cylinder engines of that company, whether of express passenger, mixed traffic, goods, mineral or tank types. A bold step has, however, been taken on the Great Eastern Railway by fitting cylinders with a stroke of 28 in. inside the frames in the case of the latest 4–6–0 engines, this being the only such instance in the country, as far as I am aware. The objection to a stroke of excessive length for inside cylinders is that, owing to the necessity of driving on the leading coupled axle, the short connecting rods take a somewhat angular position at the middle of each stroke, causing undue strain on the guide bars. It

Photo] GREAT CENTRAL RAILWAY. [*F. H. Gillford.*

12.15 p.m. Marylebone-Manchester Express near Bulwell Common. 4–6–0 locomotive No. 425 *City of Manchester*.

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is only fair to the Great Eastern Railway, however, to say that no such trouble has been experienced with these engines, on which the experiment, if such it might be called, has been attended with complete success. A stroke of 28 in. is also being adopted on the new two-cylinder 4–6–0 engines of the London and South Western Railway, and Mr. Gresley's new 2–8–0 locomotives of the Great Northern Railway, as also in the case of the promised "Baltic" tanks of the London, Brighton and South Coast Railway, previously mentioned. The Great Northern Railway still achieves distinction in that its "Atlantic" locomotives as the new London, Brighton and South Coast Railway 4–6–4 tanks are, as we have seen, being equipped with cylinders 22 in. by 28 in., with a volume of 12.33 cub. ft. One may really be pardoned for wondering what immediate traffic developments the Brighton authorities are anticipating to necessitate the employment of these enormous cylinders! On other lines which have hitherto favoured the use of comparatively small cylinders, certain recent developments are significant. The latest four-cylinder 4–6–0 engine of the Great Western Railway —No. 4041, *Prince of Wales*—has, as already mentioned, cylinders enlarged from the

FOUR-COUPLED ENGINES.

Type.	Railway.	Typical engine. No.	Name or Class.	Superheater Employed.	Cylinders. No.	Dia. ins.	Str'ke ins.	Vol. cub. ft.
4–4–2	G.N.R.	1452		Schmidt	2	20	24	8.74
	L.B. & S.C.R. ..	421	(Class H2)	,,	2	21	26	10.43
	N.E.R.	722	(Class Z1)	,,	3	16½	26	9.66
4–4–0	Caledonian R. ..	120		Robinson	2	20¼	26	9.70
	G. & S.W.R. ..	131	(6 ft. class)	Drummond	2	19½	26	9.00
	G.C.R.	429	*Sir Alexander Henderson*	Robinson	2	20	26	9.46
	G.N.R.	51	(Class D1)	Schmidt	2	18½	26	8.10
	G.N.R. (I.) ..	174	*Carrantuohill*	,,	2	19	26	8.54
	G.S. & W.R. ..	341	*Sir William Goulding* ..	,,	2	20	26	9.46
	G.W.R. ..	3818	*County of Radnor* ..	Swindon	2	18	30	8.84
	,, ...	4101	*Auricula*	,,	2	18	26	7.67
	L. & N.W.R. ..	2663	*George the Fifth*	Schmidt	2	20¼	26	9.94
	L. & S.W.R. ..	463		Drummond	2	19½	26	9.00
	L. & Y.R. ..	1112	(Re-built class)	Schmidt	2	20	26	9.46
	Midland R. ..	493	(Re-built class)	,,	2	20¼	26	9.94
	N.B.R.	400	*The Dougal Cratur* ..	,,	2	20	26	9.46
	N.S.R.	38		,,	2	20	26	9.46
4–4–4T	N.E.R.	2143	(Class D)	Schmidt	3	16½	26	9.66
4–4–2T	L.B. & S.C.R. ..	22	(Class I3)	,,	2	21	26	10.43
	G.W.R. ..	2221		Swindon	2	18	30	8.84
	N.S.R.	8		Schmidt	2	20	26	9.46
2–4–2T	L. & Y.R. ..	227		,,	2	20	26	9.46

T Tank Locomotives.

boast the shortest stroke of all modern express locomotive types—24 in.

It is the question of cylinder volume, shown in the last column, however, that provides the most interesting study, and here the modern trend in favour of enhanced cylinder capacity is more definitely and clearly marked. At present the greatest cylinder volume is that of the four-cylinder 4–6–0 engines of the London and North Western and Lancashire and Yorkshire Railways, which totals 12.11 cub. ft., but this figure will shortly be surpassed in a quarter which is, to say the least of it, unexpected, previous standard diameter of 14½ in. to one of 15 in., increasing the total cylinder volume from 9.61 cub. ft. to 10.65 cub. ft., and it is stated that the modification has met with such success in working that it will be perpetuated in future engines of this type. Again, although the constructional peculiarity of cylinders only 20 in. diameter by 24 in. stroke is retained in the case of the Great Northern superheater "Atlantics," yielding a volume—8·74 cub. ft.—that is the lowest but three in the whole table, it may be remarked that the 2–6–0 engines of the same company have 20 in. by 26 in. cylinders

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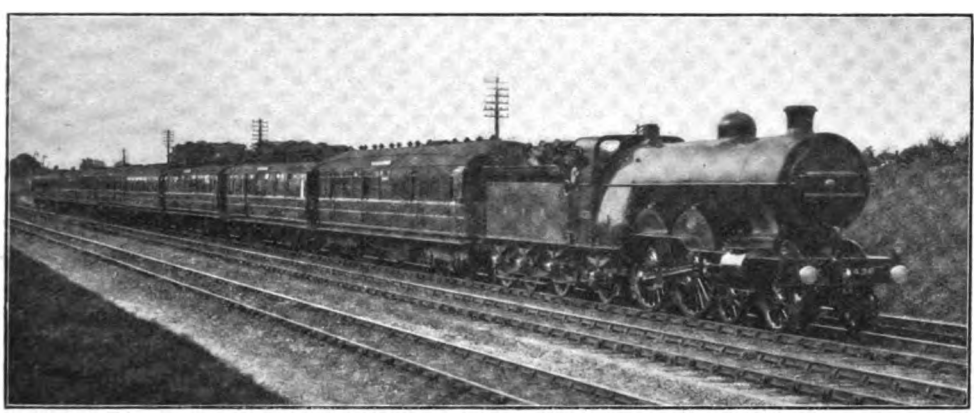
with a volume of 9·46 cub. ft., while the still more recent 2–8–0 engines for mineral traffic are equipped with 21 in. by 28 in. cylinders, having a volume of 11·24 cub. ft. It may reasonably be expected, therefore, that the same progression in volume will characterise the next express locomotive type to issue from Doncaster Works, thus bringing the Great Northern into line with other British companies in this respect.

It is worthy of note that only 6 out of the 16 ten-wheeled tender locomotives shown have a cylinder volume less than 10 cub. ft. Of these the 9·94 cub. ft. of the London and North Western "Prince of Wales" class falls but very little short of this figure; the 9·34 cub. ft. of the Great Western two-cylinder 4–6–0's and the Caledonian superheater 4–6–0 engines are easily understood, as these two companies, on the whole, are engines no fewer than 10 out of 14 are now found with cylinder volumes between 9 and 10 cub. ft., against the 8·54 cub. ft. of the 19 in. by 26 in. cylinders that were once so common. The lowest place in this batch is taken by the Great Western "Flower" class, with cylinders only 18 in. by 26 in. and a volume of 7·67 cub. ft., although this is closely approached by the 8·10 cub. ft. of the D1 class on the Great Northern Railway, with cylinders of ½ in. greater diameter. Modern superheater tank engines are in line with the latest 4–4–0 locomotives in the matter of ample cylinder dimensions, only the two Great Western types out of all those shown having a cylinder volume less than 9 cub. ft., and in these cases only by the small margin of ·16 cub. ft. It is, of course, impossible to make any deductions from cylinder dimensions alone, apart from their



Photo] GREAT NORTHERN RAILWAY: *[F. E. Mackay.*

Leeds, Bradford and Scarborough express. 4–4–2 locomotive No. 1436.

inclined to favour moderation in cylinder dimensions. The same may be said of the North Eastern Railway, the volume of the three cylinders of the superheater "Atlantics" being nearly identical with that of the second batch of "Atlantics" of the V class which had cylinders 19½ in. diameter by 28 in. stroke. In this case, therefore, no increase has been made in virtue of the addition of superheating apparatus. The non-superheater three-cylinder engines have, however, smaller cylinders, 15½ in. instead of 16½ in. The superheater "Atlantics" of the London, Brighton and South Coast Railway, almost identical in all dimensions save cylinders with those of the Great Northern Railway, have cylinders 21 in. diameter by 26 in. stroke, an increase of 1 and 2 in. respectively over the latter, yielding an increased volume of 10·43 cub. ft. Among 4–4–0 relation to the general dimensions of the engine, but it will be evident from these figures that superheating has been responsible for considerable modification in this direction.

Performance now claims attention, and I wish first to deal with four recent runs timed on the Midland Railway, behind a superheater 4–4–0, a non-superheater 4–4–0, and a compound locomotive, in which it must be confessed that the work of the last-named stands pre-eminent. The *venue* of this test was the 33¾-miles' stretch between Leeds and Rotherham—not by any means an ideal course, with its fairly steep grades in places, and its severe slack at Normanton, commencing at Altofts, and continuing for well over a mile. But these hindrances only served to enhance the merit of the locomotive work, as the loads in three instances

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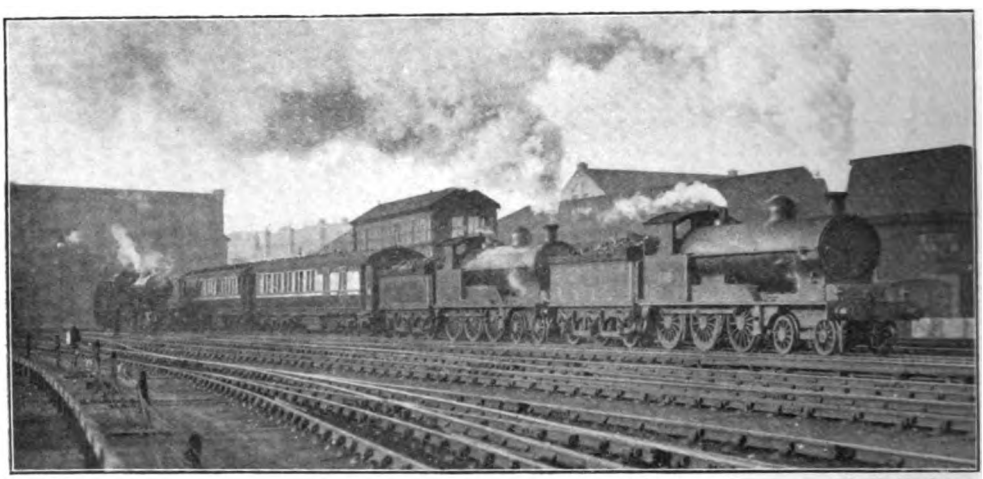
were decidedly in excess of the usual Midland standards. Re-built superheater engine No. 549 had a train of 10 eight-wheelers and 2 six-wheelers—46 axles—weighing in all 300 tons; a heavier load of 47 axles, made up of 9 vestibuled eight-wheelers, 2 eight-wheeled dining cars, and a six-wheeler, and weighing 335 tons, was taken by compound No. 1009 on the first occasion, and one less, the six-wheeler, or 320 tons, on the second run with the same engine; while non-superheater 4–4–0 No. 711 (Johnson type) had a more moderate train of 4 eight-wheelers and 2 twelve-wheeled diners, or 195 tons.

The superheater engine was delayed by signals immediately after starting, and so took 10¼ min. to pass Woodlesford, 6¼ miles from Leeds, and 16 min. 25 sec. to Normanton, 11 miles; after this the 7½ miles to Royston, averaging 1 in 300, adverse to the engine, occupied 10½ min. So we took 30 min. 20 sec. to pass Cudworth, 21 miles, and, as the speed did not exceed a maximum of 64·3 miles per hour on the gentle descent beyond to Wath, 37 min. 55 sec. to Swinton, 29 miles. Observing the usual permanent way caution at Kilnhurst, we reached Rotherham, 33¾ miles from Leeds, in 44 min. 25 sec., or about 43½ min. net. Schedule time is 45 min. in the case of this particular train (2.50 p.m. *ex*-Leeds), but the load was considerably in excess of normal. The non-superheater engine, with its very much lighter load, did considerably better in the matter of time, passing Woodlesford in 8 min. 40 sec., Normanton in 14 min. 55 sec., Royston in 25½ min., and Cudworth in 27¾ min. From this point to Swinton a speed of about 66 miles per hour was maintained, the latter station being passed in 35¼ min., while Rotherham was passed slowly in 41 min. 5 sec. from Leeds, the train concerned (the 10.15 a.m. *ex*-Leeds) running non-stop to Sheffield. Owing to the number of checks experienced beyond Rotherham, the remainder of the run is of no moment.

Of the two compound runs, the first was decidedly the finer, and as the load was nearly 100 tons in excess of the scheduled maximum for this class of engine, the time-keeping was especially noteworthy. The train in each instance was the 1 p.m. *ex*-Leeds, booked to reach Rotherham in 41 min. On the first run Woodlesford was passed in the smart time of 9 min., and Altofts, 9¾ miles, in 12½ min., a speed of 64·3 miles per hour being attained on the virtually level stretch between these two points. Normanton was passed dead slow in 15 min. exactly, and the recovery on the succeeding incline was moderate, 10 min. 40 sec. being taken for the 7½ miles to Royston. Cudworth was passed in 27 min. 50 sec., and a sustained speed of 67 and 68 miles per hour ensued thence to Swinton, which was passed in 35 min. 20 sec. from the start, or only 5 sec. over the time of No. 711 with little more than half the load. A much heavier slack than usual was made at Kilnhurst, and finally we reached Rotherham in 41 min. 50 sec. from Leeds, or about 41 min. net.

On the second trip with No. 1009 we were slightly checked at the start, and so took 9 min. 20 sec. to pass Woodlesford, and 15½ min. to Normanton; the recovery from Normanton and Royston was



[*Photo* LONDON AND NORTH WESTERN RAILWAY: [*F. E. Mackay.*

2 p.m. Glasgow–London express leaving Carlisle. 4–6–0 locomotives Nos. 2609 and 2622 *Eunomia*.

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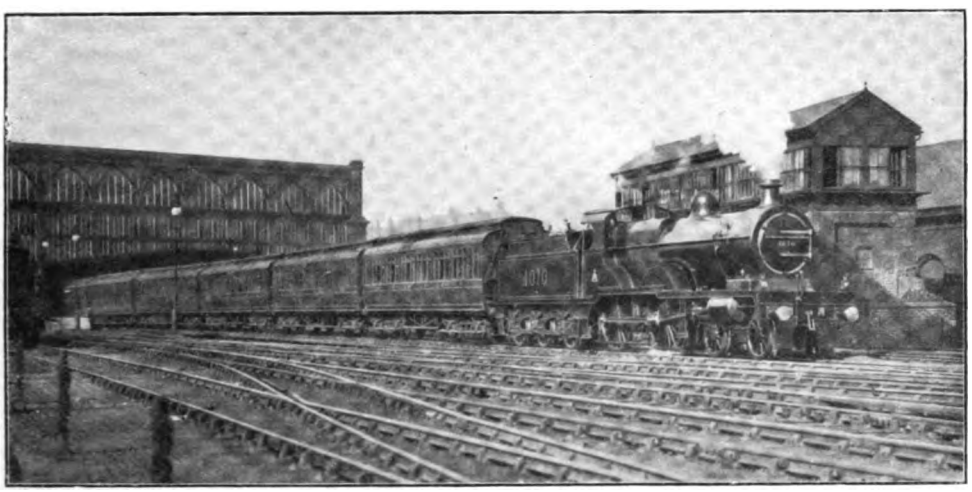
the best of the series, however, the time being 10½ min., but, unfortunately, we experienced a permanent way check just beyond this point, causing us to take 28½ min. to Cudworth. Again, the speed beyond Cudworth did not exceed a maximum of 64·3 miles per hour, and our time to Swinton was thus 36 min. 5 sec., ¾ min. above that of the last-mentioned run. The conclusion of the run was spoilt by signal checks, a long slack through Parkgate being succeeded by a dead stand at Parkgate Junction signals, 33 miles from Leeds, in 42 min. 20 sec. from the start. An unchecked run would have probably brought us into Rotherham in about 41½ min. from Leeds. Considering the obstacles to speed and the heavy load, such work is quite praiseworthy, but in comparing the *ex*-Leeds previously mentioned: this train is scheduled in the working book to cover the 162 miles from Rotherham to St. Pancras in 177 min., at an average speed of all but 55 miles per hour. On this occasion No. 737 took forward from Rotherham a load of 7 eight-wheelers, including dining cars, and weighing in all 195 tons. The start was one of characteristic Midland smartness, Eckington, 9½ miles out, being passed in 11¾ min., at a speed of exactly 60 miles per hour, and Chesterfield, 16 miles, in 18¾ min., after the usual severe slack at Tapton Junction crossover. From Killamarsh up to Clay Cross, the grades are entirely rising—not steeply, but averaging from 1 in 308 to 406, so that this start represented fine work. The 4 miles from Chesterfield to Clay Cross, where



Photo] [*F. E. Mackay.*

MIDLAND RAILWAY.
11.0 a.m. Glasgow-St. Pancras express leaving Carlisle.
Compound Locomotive No. 1010.

work of compound and superheater it must be remembered that the former, with its larger boiler, has a decided advantage in the matter of steam production.

While dealing with Midland runs, and more especially as it is now some time since I described any performance on this line south of Leeds, I wish to direct attention to a further series of four runs between Leicester and London. Two of these were made behind non-compound engines of the large 4–4–0 type, on trains not calling at Leicester, and the other two with compound engines on up expresses running between Leicester and London on the 105-min. schedule. The first run was a continuation from Rotherham of one of the runs with the 1 p.m. express the second service slack was made, took 4 min. 55 sec., while the ensuing 3½ miles of steep ascent at 1 in 160 to Doe Hill summit took 5½ min. To this point, therefore, up grades uniformly rising and inclusive of two severe slacks, the initial 23½ miles had taken 29 min. 10 sec. The usual cautious running ensued on the gently falling grades beyond to Trent, and we were further delayed by a severe signal check at Ilkeston Junction, so that the 18¾ miles from Doe Hill to Trent, passed dead slow, occupied as much as 22 min. 10 sec.—nearly 3 min. more than the normal time. We got away well from Trent to Leicester, however, passing Loughborough, 8¼ miles, in 9½ min. at 63.8 miles per hour, and running through the centre of Leicester

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station, 20¾ miles from Trent, in exactly 22 min. We had, therefore, covered the 63 miles from Rotherham to Leicester in 73 min. 20 sec., or about 70¼ min. net, against a schedule time of 73 min.

From Leicester to London I have tabulated the times of all four runs, both for the sake of ready comparison, and also to reduce the description of them to the smallest possible compass; each run is shown for convenience to start at zero. Continuing with the first run, we accelerated to 55·6 miles per hour on the gradual rise past Wigston, although the last 4 miles to Kibworth summit, mostly at 1 in 199, 161 and 156, reduced the rate to 52·9, but once beyond the summit we touched 73·8 miles per hour on the sharp descent past East Langton. There was a very slight check at Market Harborough, and our lowest speed on the four-mile ascent at 1 in 132 to Desborough was exactly 45 miles per hour—an exceedingly creditable figure. Following this a high speed was attained on the descent past Kettering, and a maximum of 78·9 miles per hour, with the somewhat unusual result that the difficult 29-min. schedule from Leicester to Kettering was all but observed, while over a minute had been gained on passing Wellingborough. Unfortunately, the Irchester permanent way slack spoiled the ascent of Irchester bank, although on the 1 in 120 an acceleration to fractionally over 40 miles per hour was recorded. Down Sharnbrook bank, however, we touched 78·9 miles per hour again, and after a slight check for Oakley troughs, a further maximum of 68·1 was reached at Bedford, where, despite the Irchester check, we were still on time. A minute was lost on the long climb to Toddington summit, which includes a full 11½ miles at 1 in 200, and a fairly fast run ensued into St. Pancras, with maxima of 70·3 miles per hour at Chiltern Green, 77·5 at Radlett and 70·3 at Hendon. The journey from Rotherham to London had been completed in 5 sec. over the allotted time, with delays aggregating fully 5 min., leaving a net time of 172 min.

A somewhat curious history attaches to the second log, which was supplied to me through the kindness of a correspondent. The train in question was the 3.55 p.m. summer express from Nottingham to London—the relieving or Edinburgh portion of the up day Scotch express—which is scheduled

MIDLAND RAILWAY: LEICESTER-ST. PANCRAS.

	Engine type		Schedule Times.	Johnson 4–4–0			Schedule Times.	Deeley 4–4–0 Compound	
	Engine No.			737	744			1012	‡1039
	Load (axles)			28	†28			28	50
	Load (tons)			195	†195			195	330
Mls.			MINS.	M. S.	M. S.		MINS.	M. S.	M. S.
—	Leicester	pass		—	—	dep.		—	—
3¾	Wigston	,,	—	5.20	5.55	pass.	—	6.05	6.30
10¼	Kibworth	,,	—	12.45	13.30	,,	—	13.25	13.50
16	Market Harborough	,,	—	18.05	19.00	,,	—	19.10	19.00
21	Desborough	,,	—	23.50	25.05	,,	—	25.55	26.00
27	Kettering	,,	29	29.10	¶30.45	,,	30	31.45	31.30
34	Wellingborough	,,	36	34.55 *	37.05	,,	37	37.50	37.20
39¼	Sharnbrook Summit	,,	—	42.00	42.45	,,	—	43.25	42.40
49¼	Bedford	,,	51	51.10	51.25	,,	52	52.45	51.30
57¼	Ampthill	,,	—	60.10	59.40	,,	—	60.25	59.40
66¼	Leagrave	,,	—	70.55	69.50	,,	—	70.30	70.10
68¾	Luton	,,	72	73.20	72.20	,,	73	73.05	72.40
79	St. Albans	,,	82	82.50	82.25	,,	83	83.00	82.05
86½	Elstree	,,	—	89.30	88.50	,,	—	90.15	88.00
92	Hendon	,,	—	94.50	93.35	,,	—	95.10	92.35
95½	Finchley Road	,,	—	98.10	96.55	,,	—	98.35	95.35
97	Mile-post 2	,,	—	—	—	arr.	—	—	97.10
99	St. Pancras	arr.	104	103.45	102.45	,,	105	103.40	104.20
99	Net time (mins.)		104	101¾	102¾		105	103¾	100¼

‡ Pilot—4–2–2 No. 685, "Princess of Wales" class.
† 24 axles (170 tons) from Kettering. ¶ Carriage slipped.
* Severe permanent way check, Irchester.

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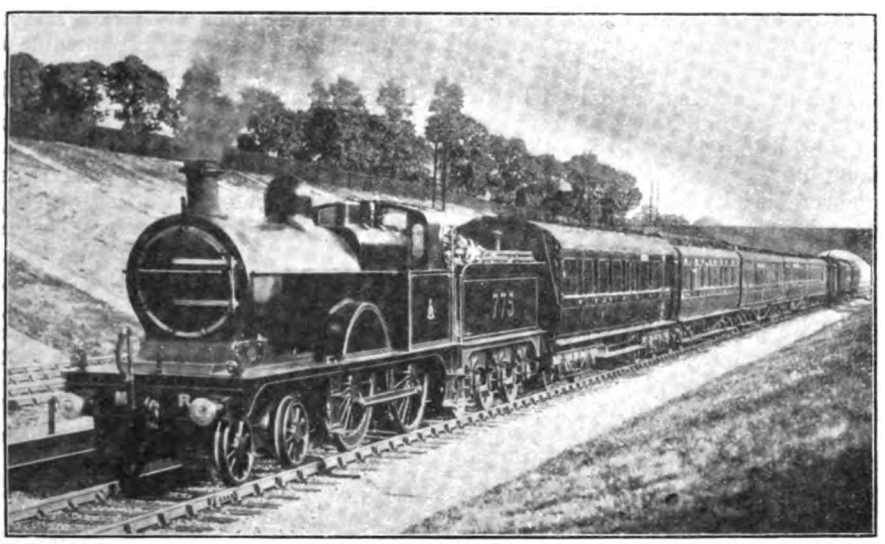
to cover the 123½ miles to London non-stop in 2 hr. 20 min. My friend was travelling at the time of the memorable rainstorms in the late summer of 1912, and as the direct line to Kettering was under water in the neighbourhood of Melton, the train was reversed at Nottingham, and sent *viâ* Leicester—an increased distance of 3 miles, with severe slacks at Trent and Leicester, but no slack at Kettering. Starting from Nottingham, No. 744 passed Trent, 6¾ miles, in 9¾ min., but the speed thence to Leicester was barely up to the usual standard, as 10 min. were taken to Loughborough, 8¼ miles, and 24½ min. to Leicester, 20¾ miles, the latter time being 2½ min. in excess of the standard non-stop timing for expresses. The remainder of the run appears in the second column, the detour and the extra slack. It is worthy of record that, under such exceptional circumstances, the train was only 1 min. 20 sec. late on arrival at St. Pancras.

The first compound run was made on the 6.10 p.m. express *ex*-Leicester, under the disadvantage of a very strong easterly wind, and is remarkable as illustrating the tendency in modern running in the direction of improved uphill work and moderate downhill speeds. The start was brilliant, the time to Wigston being only 10 sec. in excess of that of the preceding run by a train which had not stopped at Leicester. At Kibworth the times of the latter had been passed, the minimum speed at the summit being 51·3 miles per hour. But at East Langton we only touched 71·4 miles per hour, and



Photo] MIDLAND RAILWAY: [*F. E. Mackay.*

Leeds–Bradford–Heysham express. 4–4–0 locomotive No. 775.

and it is to be regretted that my correspondent has not furnished details as to maximum and minimum speeds. No particular brilliance in running was displayed until after Kettering, where the slip coach was detached, but thereafter, with a reduced load of 170 tons, there was a decided quickening. In fact, the Sharnbrook summit-Bedford time was the fastest of the series, while the gaining of time on schedule between Bedford and Luton, if only to the extent of 5 sec., is but a rare occurrence. So the excellent times of 72 min. and 51 min. 20 sec. from Kettering and Bedford respectively to London were secured, the whole run from Nottingham having been completed in 2 hr. 17 min., or 3 min. under booked time despite making a pronounced slack at Market Harborough, our speed fell to 38·1 miles per hour on the ensuing ascent. At Kettering also the maximum rate was only 71·4 miles per hour, so that by Wellingborough our times were behind those of the other three runs. Beyond Sharnbrook the wind made itself keenly felt, and for the third time our maximum rate was 71·4; consequently at Bedford we were still further in arrears. But now a wonderful effort was made. Immediately beyond Bedford we touched a maximum speed of 72·5 miles per hour, and then up all the long rise to Ampthill, culminating in four continuous miles at 1 in 200, we did not drop below 57, save for a momentary fall to 55 in the tunnel. The slight drop to

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Flitwick raised our speed to 60 again, and we finally breasted Toddington summit at a minimum speed of 48·9 miles per hour. Consequently the times throughout this stretch beat anything I have previously recorded, more particularly that from Bedford to Ampthill. In consequence of this magnificent running Luton was passed well on time, and an easy run into the terminus, concluding with an unusually clear road and fast time from Finchley Road, brought us in 1 min. 20 sec. before time.

The last run was made on one of those occasions when one looks for anything but record-breaking—the day before Christmas Eve. The train also was over half-an-hour late from Leicester, being the Scotch express due away at 6.30 p.m., and due into St. Pancras at 8.15 p.m. With a load of 90 tons in excess of the maximum allowance, we took a pilot to London—a large "single" of the "Princess of Wales" class. We started briskly, and speed only fell to a minimum of 52·9 miles per hour at Kibworth, this being followed by the high maximum of 75 at East Langton, but a really severe slack was made at Market Harborough, which seriously impaired our climb to Desborough. Our speed on the latter incline, indeed, fell to 38·1 miles per hour. Through Kettering, too, the rate was comparatively moderate, not exceeding 71·4 miles per hour, but from this point matters brightened up very considerably. At Isham we were running at 72·5 miles per hour, and a fast time was made to Sharnbrook summit, the minimum speed being only a fraction under 45 miles per hour on the 1 in 120. Down Sharnbrook bank we touched 80·3 miles per hour, and good time was also made from Bedford up to Luton, speed not dropping below 51·3 miles per hour at Ampthill and 47·4 at Toddington summit. From Luton we were treated to a veritable orgy of speed. The Luton-St. Albans time was the fastest of the four, while at Radlett we were doing 81·8 miles per hour. So well, also, was speed maintained that at Elstree tunnel, after three miles up at 1 in 200, we were still doing 64·3 miles per hour, and the rate rose again to 78·9 at Hendon. At Finchley Road we had all but reached "even time," and we must actually have done so very shortly after entering the tunnel, which we did at a high rate of speed. But luck was against us now, as we were brought to an abrupt stop for signals just beyond Haverstock Hill, opposite the second mile-post.

We had completed the start-to-stop run of 97 miles to this point in the remarkable time of 97 min. 10 sec., and, judging by contemporary runs, we should have experienced no difficulty in reaching St. Pancras, with a clear road, in 100½ min., or possibly even in 100 min. Without the unduly severe slack at Market Harborough it would have been easily practicable to have made "even time" from Leicester to St. Pancras, representing a 6-min. gain on so fast a schedule as this. As will be seen, our time to St. Pancras, though inclusive of the dead stand, was yet 40 sec. under that booked. Taking a net time of 100½ min. from Leicester, we get some truly astonishing times into London. For instance, the time from Kettering to London, 72 miles, is 69 min.—booked 75; from Bedford, 49¾ miles, it is 49 min.—booked 53; from Luton, 30¼ miles, it is 27 min. 50 sec.—booked 32. 74½ miles from Desborough to Finchley Road were covered in 69 min. 35 sec.; 56¼ miles from Sharnbrook summit to Finchley Road in 52 min. 55 sec.; 39¼ miles from Leagrave to Finchley Road in 35 min. 25 sec.; and, finally, 16½ miles from St. Albans to Finchley Road in 13½ min., the last-named, over an undulating section of line, showing an average speed of 73·3 miles per hour. Had only this run been made at a little earlier date, it should have had, as it certainly deserves, a place among my "record runs" of 1913.

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The Sand Hutton Railway.

By

"VOYAGEUR."

VIEW FROM THE TUNNEL ENTRANCE.

A PROTRACTED search among the pages of the encyclopædic "Bradshaw" will fail to reveal to its most indefatigable student the whereabouts of the line indicated by the above title. This is a matter of no surprise, however, as the railway in question was neither authorized by nor constructed under Act of Parliament; it conveys passengers, but is not accessible to the general public; in short, it is a miniature railway whose existence is due to the enterprise of Sir Robert Walker, Bart., and which is laid in his park at Sand Hutton, eight miles from York. By his kindness I have been enabled to collect the subjoined particulars of this interesting little line, and also to make a number of load and speed tests with the locomotive, details of which are appended.

The gauge of the Sand Hutton Railway is one of 15 in., which virtually implies a reproduction of standard practice on a scale of one-quarter full size. Readers will no doubt be familiar with the miniature lines on this gauge laid down at Blackpool, Rhyl, Southport, Halifax, Sutton Coldfield, and at the Exhibitions at Shepherd's Bush, Nancy, &c.; and they will realise that a railway whose locomotives are capable of hauling 50 or more passengers, or of travelling at speeds up to 30 miles per hour, is no toy, but can be made to serve useful purposes, in addition to proving a most fascinating hobby. Similar 15 in.-gauge railways

HAULING A "TEST LOAD" NEAR FISHPOND TERMINUS.

Sir Robert Walker is seen seated on the back of the tender.

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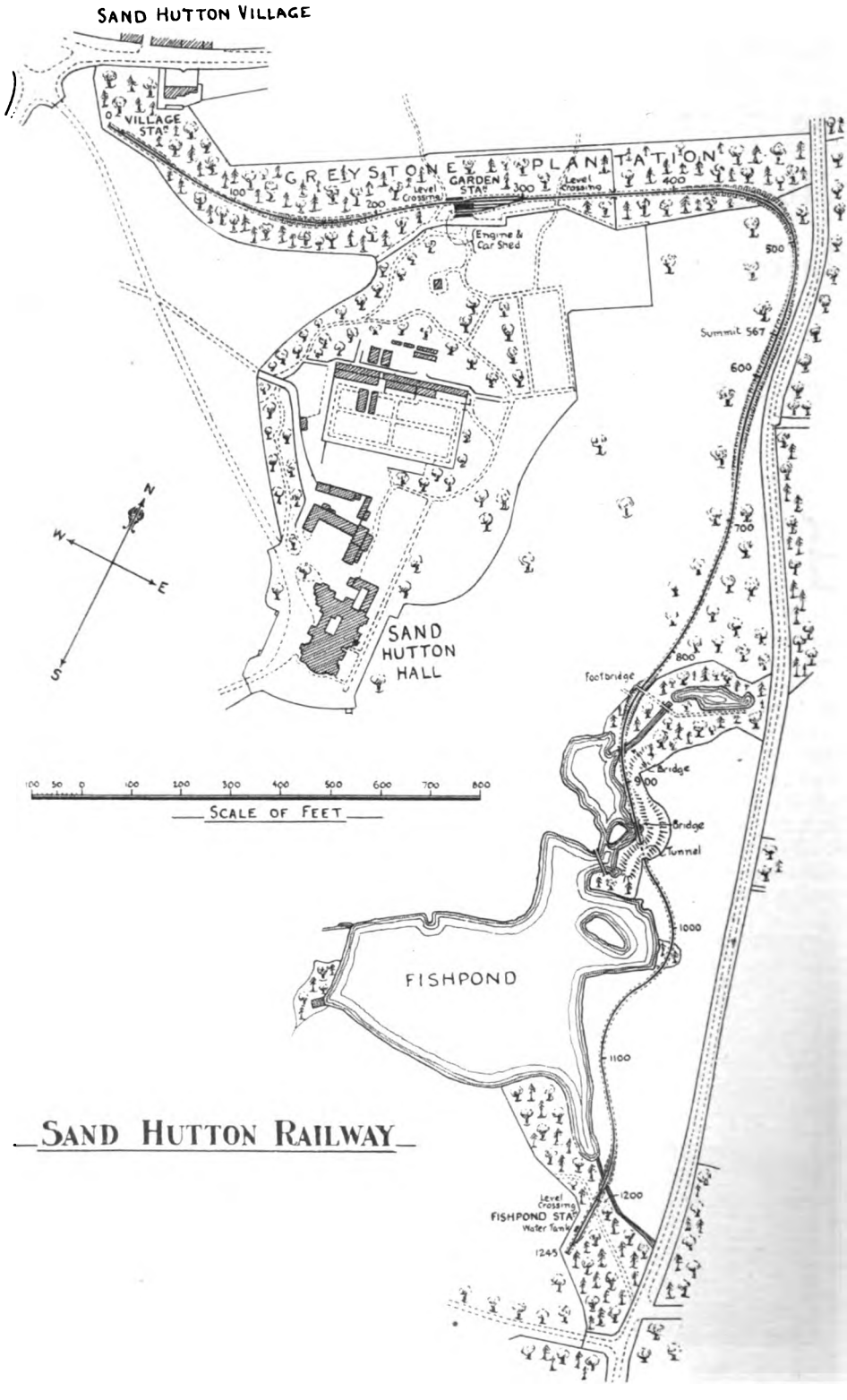

SAND HUTTON RAILWAY

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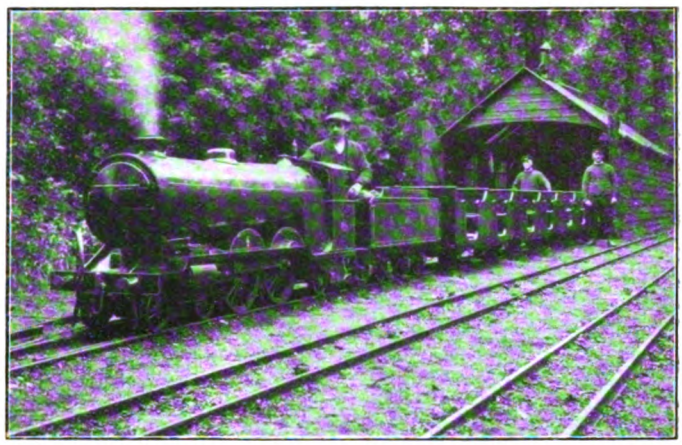

ENGINE AND TRAIN AT GARDEN STATION, WITH RAILWAY "STAFF": DRIVER BATTY ON THE FOOTPLATE.

have been usefully introduced by the Duke of Westminster and Mr. C. W. Bartholomew, the line in the former case connecting Eaton Hall with the Great Western Railway at Balderton, and in the latter case linking up Blakesley Hall with Blakesley station, on the Stratford-upon-Avon and Midland Junction Railway. Up to the present the Sand Hutton Railway is not thus connected to the nearest line—the York and Market Weighton branch of the North Eastern Railway—but there is a possibility that at some future date an extension will be made to Warthill station, a distance of some 2½ miles from the existing terminus, virtually all the land required being the property of Sir R. Walker, and suitably level for railway purposes, the only difficulty being that of crossing a public road *en route*.

A miniature railway in a private park generally gains immeasurably as compared with that laid in public grounds in view of its situation, which allows of much greater realism in the engineering work. The surroundings of the Sand Hutton Railway, as will be seen in the photographs reproduced, are particularly beautiful, and a trip over its length, which will be rendered clearer by use of the annexed plan, may with advantage be described. Adjacent to the main park gates, and close to Sand Hutton village, found the "Village" station. There is here a loop road, about 43 yards long, to allow of the engine running round its train. At the start the line is level, but immediately beyond begins to fall rapidly at 1 in 100, 1 in 120, and finally at 1 in 90 towards the "Garden" station. For the first 450 yards the railway is laid through the Greystone plantation, and the vista through the trees, especially along the 200 yards of straight commencing at the Garden station, is very fine. Shortly before reaching the latter, the line is carried for some distance on an embankment at an average height of about 4 ft., and then crosses on the level an asphalted footpath.

The Garden station, adjacent to the Hall gardens, is the principal depot of the railway. On the right of the line is situated a car shed, 37 ft. long by 12 ft. 9 in. wide, with three tracks, accommodating the whole of the rolling stock. On the left a platform 36 ft. long by 3 ft. wide has been erected adjacent to the path for the use of passengers. In addition to the sidings communicating with the shed, and joining the main line at a point about 31 yards further up, there is also a loop road on the left-hand side, 41 yards long, to allow of trains passing each other. This depot is located on a

4-4-2 LOCOMOTIVE "SYNOLDA".
Builders: Messrs. Bassett-Lowke, Ltd.

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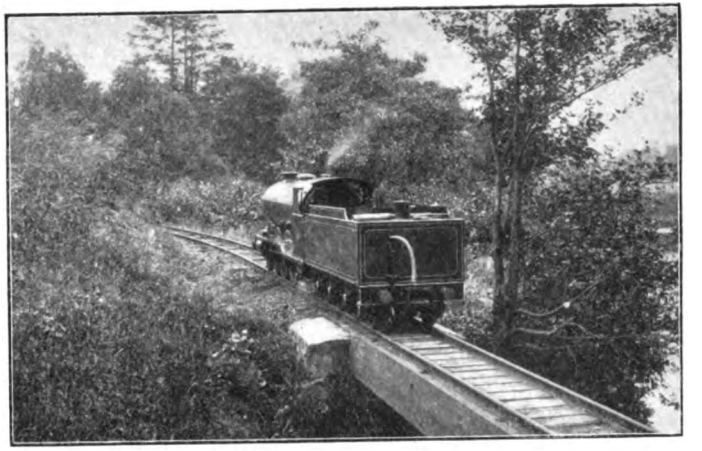
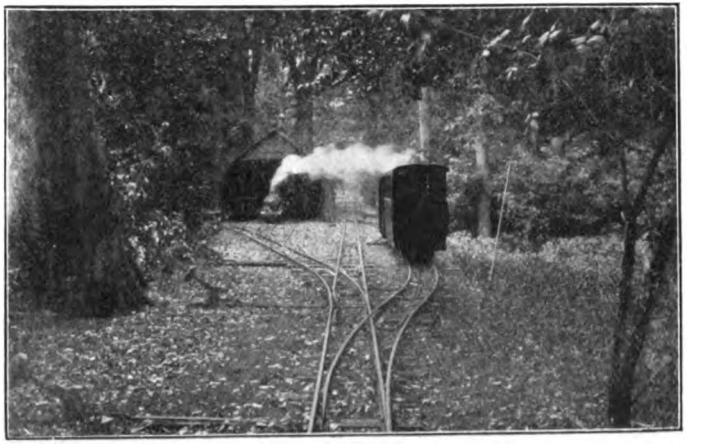
TAKING WATER AT FISHPOND TERMINUS.



AT THE LAKE-SIDE, SHOWING BRIDGE.

THE TUNNEL.



IN GREYSTONE PLANTATION.

Scenes on the Sand Hutton Railway.

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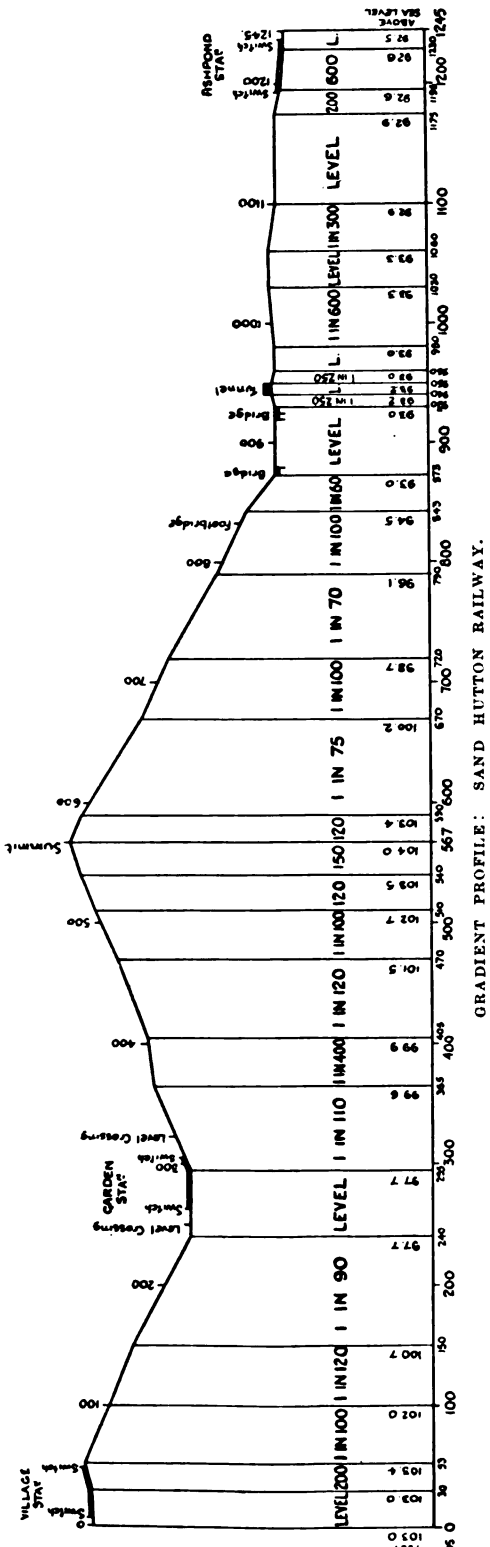

GRADIENT PROFILE: SAND HUTTON RAILWAY.

short length of level track situated between falling gradients in either direction. From the Garden station a "bank" commences, 272 yards long, and as steep at one point as 1 in 100. At its commencement a further asphalted path is crossed on the level, and about midway the line emerges from the plantation on an embankment 5 ft. high, and with a very sharp curve, on which speed is restricted. This embankment is about 100 yards long, and immediately after the line enters upon a cutting which entailed a considerable amount of excavation in clay soil. The cutting is about 150 yards long, and mainly from 4 ft. to 6 ft. deep. About halfway along this cutting is the summit point of the railway, 567 yards from the starting point, and 104 ft. above sea-level.

There now follows the heaviest grade on the system—a continuous "bank" for 306 yards averaging 1 in 83½. It commences to fall at 1 in 120, steepening at once to 1 in 75; there is then a flatter length at 1 in 100, followed by a steep drop at 1 in 70; finally there is a fall at 1 in 100 and 1 in 60 to the lake-side. The last-mentioned section is situated on a sharp curve, where reduction of speed is again imperative; here the line cuts through the corner of a small plantation, passing under a rustic footbridge and through a rock cutting, 5 ft. 6 in. deep, which has been most effectively carried out, and looks extremely picturesque. The railway now skirts the lake, passing first over a small stream by means of a substantial timber bridge of 14 ft. 9 in. span, resting on stone supports 3 ft. wide, and then over a corner of the lake itself by a two-span timber bridge, of 27 ft. 3 in. opening, on similar stone supports. Immediately afterwards there follows a tunnel, 30 ft. long, constructed by "cut and cover" work, and prettily situated in the middle of a small shrubbery. Beyond this the line follows the shores of the lake fairly closely, and with several sharp curves, finally crossing a small stream just below the lake sluice, and arriving at "Fishpond" station. Here there is a loop road 45 yards long, and a capacious water-tank, filled from the lake, for the replenishment of the locomotive water supply. The total length of the line is at present 1,245 yards.

The track is of solid construction, being laid with vignoles, or flat-footed steel rails, weighing 16 lbs. per sq. yd. in 23 ft. lengths. The rails are carried partly by standard railway sleepers, 9 ft. long by 10 in. wide by 5 in. deep, each cut into three pieces 3 ft.

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long, and partly by sleepers cut on the estate, measuring 3 ft. long by 4 in. wide by 3 in. deep. Seven of the former and eight of the latter are used per rail-length. The rails are secured to each sleeper by means of two coach-screws with wrought iron clips. Cinder ballast is employed, packed to a depth of about 2 in. beneath the sleepers, and up to sleeper level. The track has been laid on a formation 6 ft. wide, in the case of the embankments, and 4 ft. wide, in the cuttings, and is of a very substantial character for the purpose required.

Readers will, however, be interested mainly in the locomotive. This is a very handsomely proportioned machine of the "Atlantic" type, not conforming exactly to any prototype, but of the external lines generally adopted by the builders—Messrs. Bassett-Lowke, Ltd., of Northampton—and modelled approximately to a scale of 3 in. to the foot. A very large boiler, with Wootten pattern firebox, is provided, having a heating surface of 11,000 sq. in., and provided with moderate superheat, in the form of a smokebox steam-drier, of gridiron pattern, which the makers find very efficient. The cylinders are 4 in. diameter by $6\frac{3}{4}$ in. stroke, and, in accordance with the very latest "full-sized" practice, are furnished with forced lubrication, the lubricator being situated under the front end of the smokebox. It will be noticed that the cylinder dimensions are rather less than scale, but this is essential as the weight of the engine, and consequently the available adhesion weight on the driving wheels is very limited, and further cylinder power would only provoke slipping. The driving wheels have a diameter of 19 in., equal to about 6 ft. 4 in. in the case of the "real thing." A working pressure of 120 lbs. per sq. in. is employed, thereby affording the engine a tractive effort of no less than 680 lbs., or of 510 lbs. at 75 per cent. of the working pressure.

The footplate is equipped in quite the normal style, the driver being accommodated with a seat on the eight-wheeled tender, which will, if necessary, seat two persons side by side, in addition to having a capacity for 55 gallons of water, and a fair amount of coke for firing purposes. A regulator of the "pull-out" type is fitted, with water gauge, pressure gauge, right and left-hand injectors, steam brake on the engine, and a most ingenious form of vacuum brake on the cars, with engine ejector and footplate vacuum gauge. In the smokebox is provided a steam blower of the usual type, for the maintenance of the draught when the engine is standing; for getting up steam in the first instance a long loose chimney is attached to the engine chimney when required. The boiler of the engine is lagged with asbestos sheeting. Overall the engine and tender measure 15 ft. 9 in., and they weight together in working order 2 tons 12 cwt.; the height from rail level to the top of the chimney is 3 ft. 4 in. Altogether it is not surprising that the makers should claim this to be the most powerful 15 in. gauge model locomotive yet built, and it is certainly a remarkable example of model engineering skill. The locomotive is named *Synolda*, after Lady Walker.

Rolling stock consists of four open four-wheeled passenger cars, one bogie covered passenger coach on eight wheels, one four-wheeled covered passenger brake-van, and a small four-wheeled tip wagon. The four-wheeled passenger cars have two compartments each, accommodating in all eight passengers, two a-side. They are each equipped with the continuous vacuum brake, the vacuum cylinder consisting of a spherical casting; this contains a rubber diaphragm, which is connected direct to the brake levers. On the creation of a vacuum with the engine ejector, the diaphragm is sucked inwards, and the brake applied. The vacuum, therefore, is only created at the moment of applying the brake, the apparatus differing in this respect from the ordinary vacuum brake. In the photographs the vacuum connections are clearly seen; their curious diagonal position is necessary, as sufficient flexibility could not be secured in the ordinary position. Built by Messrs. Bassett-Lowke, Ltd., the cars weigh 7 cwt. each, empty. The bogie coach and the van, however, were constructed at Sand Hutton by Sir Robert Walker, and are handsome vehicles, weighing 10 cwt. apiece. A total of 10 passengers is accommodated in the passenger car, which is a centre-corridor vehicle, with reversible garden seats, and is provided with observation windows in front and rear and at the sides. The van is equipped with sliding doors, and has also benches at each end seating four people in all, but it is on record that on a certain day when a heavy "holiday" traffic was being conveyed, no less than 17 passengers were squeezed into this capacious vehicle! On the occasion in question, a total train-load of 75 passengers was packed into the cars for one trip, but normally there

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is seating accommodation for 48 persons. All the cars are finished uniformly in varnished teak.

Load and speed tests, of which details are given in the annexed table, were most interesting. Unfortunately, the necessity for cautious running at the curves made it impossible to test the engine at her maximum speed, this being especially the case with the lighter loads. The down runs were particularly hampered in this respect between post 800 and the far end of the line. On runs Nos. 1 and 2 the complete train of six cars was in use, with a load of 44 passengers, in addition to the tip wagon loaded with 2½ tons of sand bags, giving a total weight of 8 tons 4 cwt. behind the tender. This was equal to 3·2 times the weight of engine and tender, or, say, 375 tons in the case of a modern "Atlantic" express locomotive. Yet the 300 yards from posts 300 to 600, almost entirely uphill, were traversed in 46 and 44 sec. respectively, at a speed of 13·3 and 14 miles per hour, which is equivalent to 53·2 and 56 in the case of the real prototype. In each case the maximum speed was on the down grades between posts 700 and 800, the 100 yards being traversed in 11 sec., at 18·6 miles per hour, or 74·4 miles per hour "to scale." The average throughout speeds of 13·1 and 13·2 miles per hour on these two trips were quite excellent, as these scale out to 52·4 and 52·8, despite the heavy loads hauled.

On run No. 3 the ballast truck was detached, and the number of passengers reduced to 3, making the load only 2 tons 12 cwt., or exactly equal to that of engine and tender. This might be taken as 120 tons in the case of the prototype. Of course, such a light load as this presented no difficulties, but the constant slacks for curves spoiled the times; nevertheless, some fast running was made. The first 400 yards took exactly 1 min., 200 of them being covered in 21 sec., at 19·5 miles per hour (= 78 miles per hour); from post 600 to post 700 took 9 sec., at 22·7 miles per hour (= 90·8). Faster times still were made on the next trip, the time by stop-watch between posts 300 and 400 being 8 4-5th sec., which represents a maximum speed of 23·25 miles per hour, or no less than 93 miles per hour in the case of a full-sized locomotive. This was really thrilling, as was also the time of 30 sec. between posts 500 and 800, representing an average of 20·45 miles per hour, or 81·8 to scale. The speed on the last-mentioned run represents about the safe limit, considering the curved nature of the track, and on this account nothing would have been gained by further reducing the load, which was in this instance one open car, the bogie passenger car, and three passengers, or 19

SAND HUTTON MINIATURE RAILWAY.
LOAD AND SPEED TRIALS.

DOWN (engine pulling load).					UP (engine pushing load).			
Run No.	1.	2.	3.	4.	Run No.	5.	6.	7.
Load ..	8 T. 4 C.	8 T. 4 C.	2 T. 12 C.	0 T. 19 C.	Load ..	8 T. 4 C.	2 T. 12 C.	0 T. 19 C.
Yds.	M. S.	M. S.	M. S.	M. S.	Yds.	M. S.	M. S.	M. S.
0	0.00	0.00	0.00	0.00	1245	0.00	0.00	0.00
100	0.20	0.23	0.26	0.25	1200	0.22	0.10	0.12
200	0.35	0.41	0.39	0.37	1100	0.55	0.28	0.32
300	0.50	0.54	0.50	0.47	1000	1.16	0.43	0.43
400	1.04	1.09	1.00 *	0.56 *	900	1.35	0.54 *	0.54 *
500	1.20	1.21	1.14	1.07	800	1.53	1.07	1.07
600	1.36	1.38	1.27	1.17	700	2.15	1.19	1.17
700	1.49	1.52	1.36	1.26	600	2.40	1.32	1.28
800	2.00 *	2.03 *	1.47 *	1.37 *	500	3.03	1.45 *	1.39 *
900	2.15	2.16	2.01	1.50	400	3.16	1.56	1.50
1000	2.30	2.33	2.14 *	2.03 *	300	3.30	2.05	1.59
1100	2.44	2.47	2.27	2.16	200	4.04	2.14	2.09
1200	3.03	3.04	2.41	2.30	100	4.58	2.25	2.20
1245	3.15	3.16	2.51	2.40	0	5.20	2.53	2.44
Av. speed m. p. h.	13·1	13·2	14·9	15·9	Av. speed m. p. h.	8·0	14·7	15·5
do. do. x 4	52·4	52·8	59·6	63·6	do. x 4	32·0	58·8	62·0

* Speed reduced for curves.

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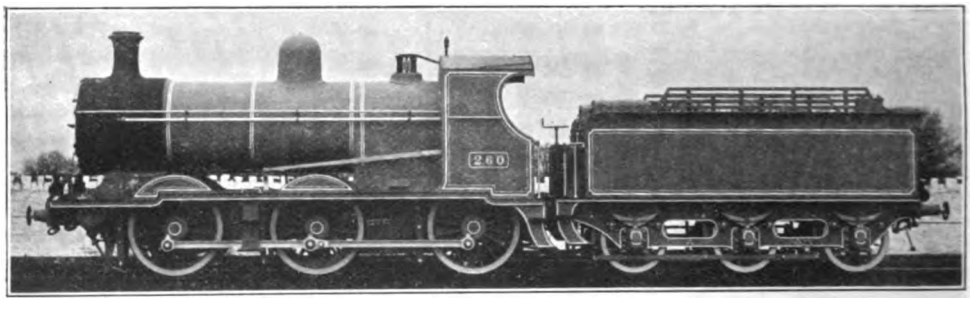
cwt. only behind the tender. It may be noted that the starts on runs 2 and 3 were comparatively slow, as compared with those on runs 1 and 2, but the trains in the latter instances were started as far back as possible.

Return journeys were made in every instance with the engine pushing the train, and this will account for the comparatively slow time on run No. 5, as, with a load of seven vehicles in front of the engine, it was considered advisable to moderate the speed. Run No. 6, however, with a similar load to that of run 3, was taken at high speed; and the work in this instance up the 1 in 75 between posts 700 and 600 was good, showing an average of 15·7 miles per hour, equal to 62·8. As a matter of fact, with this light load the engine is capable of almost any speed: in the next column (7) it will be noticed that 18·6 miles per hour was maintained right up the 1 in 70 and 1 in 75 from post 800 to post 600, equivalent to no less than 74·4 miles per hour uphill! The highest speed of the day was reached in this direction when the writer was at the regulator, and the load similar to that last-mentioned; taking the curve between posts 500 and 400 at a higher speed than customary, and then throwing the regulator wide open, we touched a speed which was estimated by observers at the Garden station to be fully 30 miles per hour. Unfortunately, the duties of keeping a good look-out—highly necessary when travelling tender first at a speed equivalent to 120 miles per hour on a full-size track!—prevented a stop watch reading being taken, but in any case the engine is fully capable of such a speed, and the maximum attained must have been very near this figure. But 30 miles an hour, on a gauge of 15 in., is an experience not to be forgotten!

In conclusion, I must tender my thanks to Sir Robert Walker, Bart., for his kindness in providing facilities for making these speed tests and for acquiring the information contained in this article. Further extensions of this enterprising line will be watched with no little interest.

Superheater Goods Locomotive: Great Southern & Western Railway.



THESE LOCOMOTIVES WERE PUT IN HAND BY MR. R. E. L. MAUNSELL, AND COMPLETED BY MR. E. A. WATSON, AT INCHICORE WORKS. THEY HAVE SCHMIDT SUPERHEATERS AND OTHER USUAL FITTINGS.

Cylinders	19 in. × 26 in.	Heating surface—tubes	844 sq. ft.
Coupled wheels	5 ft. 1 in. diam.	,, ,, firebox	118 sq. ft.
Pressure	160 lbs. per sq. in.	,, ,, superheater	224 sq. ft.
Weight in working order	47 tons 4 cwt.	,, ,, total	1,186 sq. ft.
Engine and tender	37 tons 6 cwt.	Grate area	20·4 sq. ft.

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The Railways of Anglesey.

[No. I.]

By G. W. J. POTTER.

" I will go to the land of Mona, notwithstanding the water of the Menai, across the sand, without waiting for the ebb."

GEORGE BORROW.

MEDAL ISSUED IN COMMEMORATION OF THE OPENING OF THE BRITANNIA TUBULAR BRIDGE.

ANGLESEY, an island of comparatively small extent, and almost entirely pastoral and agricultural as regards its industries, is by no means badly supplied with railways, for there are at the present time nearly 50 miles of railway track in an area of about 276 square miles. When one thinks of its situation at the extreme north-west of Wales, and then remembers the course of the chief trunk lines of England, no surprise will be felt when it is discovered that the island is, in the matter of railways, a close preserve of the London and North Western Railway Company.

The railway history of Anglesey goes back to an early period, prior to the days of the Chester and Holyhead Railway (now absorbed in the London and North Western system) and even before the time of the Stockton and Darlington Railway, for it was in the year 1812 that a railway was authorised to be constructed in the island, of which scheme a brief notice will be given later on.

A glance at the map will show that there are three lines of railway in Anglesey: (*a*) from the Britannia Tubular bridge to Holyhead; (*b*) from Gaerwen to Amlwch; (*c*) from Holland Arms to Red Wharf Bay and Benllech; and these will be dealt with in this order.

" The land of Mona " referred to in the quotation which heads this article is, of course, Anglesey, though the name Mona is usually applied to the Isle of Man. It would seem that Anglesey, or " Angle's ey," meaning the " island of the Angles," must have been so called by certain of the Angle tribes after they had crossed the North Sea and had pursued their conquering way throughout the greater part of Britain. The title has survived to this day, the Welsh name for the island being " Ynys Môn " (pronounced " Unnis Mōn ") the " Isle of Mon." The Romans appear to have added the letter " a " to the word to adapt it to their language, and in the time of Julius Cæsar it was called *Mona Insula*.

Extreme fertility of soil and the great possibilities of sanctuary in the island, the latter being a very important consideration in the days when the Welsh on the mainland were usually engaged in murder or battle, have given to the island another and a fuller title: Mon, Mam Cymru— " Mona, the Mother of Wales."

However, the name of Anglesey or Mona is of small matter to the tourist, but what one remembers after exploring the island is the beautiful soft yet bracing air, the exquisite colours of sand, shore, and sea, and the mountains in the near distance adding a majestic touch to the scene. As a recent writer has well said, " Anglesey is an undiscovered and delightful country for those who require a complete change. It is a region of rocks and heather, sheep and sandhills. It is sparsely populated, but the salt winds that blow over it fresh from the Atlantic, and the abundant sunshine, bring health and rest to the tourist who seeks them."

The lines quoted in introduction are a translation by George Borrow of a couplet written by a Welshman, Robert Lleiaf (the least of the Roberts), about three hundred years ago. Borrow then goes on to say that " The meaning of the couplet has always been considered to be and doubtless is

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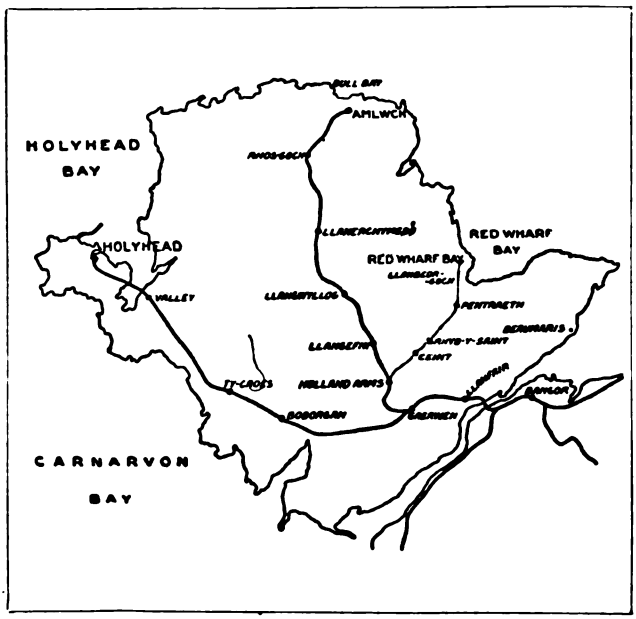

that a time would come when a bridge would be built across the Menai, over which one might pass with safety and comfort, without waiting till the ebb was sufficiently low to permit people to pass over the traeth, or sand, which, from ages the most remote, had been used as the means of communication between the mainland and the Isle of Mona or Anglesey. Grounding their hopes upon that couplet, people were continually expecting to see a bridge across the Menai: more than two hundred years, however, elapsed before the expectation was fulfilled by the mighty Telford flinging over the strait an iron suspension bridge, which, for grace and beauty, has, perhaps, no rival in Europe. . . . When Telford's bridge was flung over the Menai, Lleiaf's couplet was verified. But since Telford's another bridge has been built over the Menai, which enables things to pass which the bard certainly never dreamt of. He never hinted at a bridge over which thundering trains would dash, if required, at the rate of fifty miles an hour; he never hinted at steam travelling, or a railroad bridge, and the second bridge over the Menai is one."

In his enthusiasm for Wales and the Welsh people Borrow credits Lleiaf with a remarkable foresight, though he denies to him the power of so-called second sight (really the seeing of events before they happen). This honour however, he endeavours to ascribe to a Welsh bard of a later date. He states that in a publication called *The Greal*, a four-line verse was printed in 1792, and that the language in which it was couched showed it to be a production of the middle of the seventeenth century. He then translates it as follows:

I got up in Mona as soon as 'twas light,
At nine in old Chester my breakfast I took;
In Ireland I dined, and in Mona, ere night,
By the turf fire sat, in my own ingle nook.

Another version by a different hand runs:

I'll rise and dress myself in Mona's isle,
Then in Caerlleon to breakfast stay awhile,
In Erin's land my noontide meal I'll eat,
Return and sup by Mona's fire of peat.

On the strength of this stanza Borrow and certain enthusiastic Welshmen would have us believe that the bard had assuredly "foreseen" the railway bridge, also the express train and swift steamer travelling at high speed so as to enable a man to sleep in Mona, breakfast in Chester (the Welsh name for which city is Caerlleon), dine in Ireland, and sup again in Mona. Borrow's words are "Truly some old bard of the seventeenth century must in a vision of the second sight have seen the railroad bridge across the Menai, the Chester train dashing across it at high railroad speed, and a figure exactly like his own seated comfortably in a third-class carriage." A later writer intimates, and not without good cause, that this is a case of "Wild Irishman on the brain."

A prosaic and yet a more likely solution of the verse is that Robyn Ddu, the bard in question, lived near Holyhead, and one day on a visit to that seaport found two vessels waiting for cargo, named, respectively, Chester and Ireland. Robyn, his luck evidently being in, breakfasted with the captain on board the Chester, dined with the skipper of the Ireland, and then returned to his supper by his own ingle nook; and, what is even more extraordinary than Borrow's theories, he had not left Mona at all, yet had been in Chester and Ireland during the day!

Leaving the question of second sight and dealing with facts, it may be recalled that

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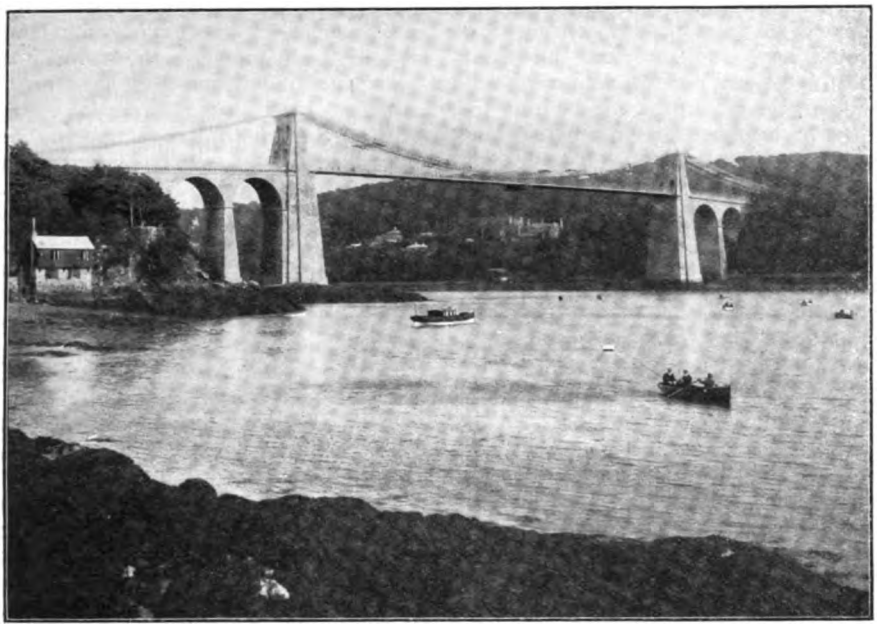

Photo] [*L.N.W.R.*

THE SUSPENSION BRIDGE ACROSS THE MENAI STRAITS.

in the early days of railroads the conviction was borne in upon the minds of certain railway engineers, notably George Stephenson, that a railway should be constructed to Anglesey for the purpose of establishing steam communication with Ireland. In 1838 Stephenson drove from Chester in a postchaise along the coast of North Wales to determine upon a route which would be suitable for a railway, due regard being paid to the gradients and the then known power of the locomotive. His decision is shown to-day by the present route from Chester to Holyhead, for this practically embodies his scheme. At that time Birmingham had only just been put into railway communication with London, while from Birmingham northwards the Grand Junction Railway continued the iron road through Crewe to Newton Junction, at a point on the Liverpool and Manchester Railway midway between those towns.

A separate company had been formed to make a railway from Chester to Crewe, and to them Stephenson went, but they refused to help in the construction of the proposed Holyhead line; as a matter of fact, they appear to have lost heart in their own undertaking and soon after merged themselves in the Grand Junction Company before they had completed their little line of 21 miles.

Then the scheme, as Mr. C. E. Stretton has shown in his interesting "History of the Chester and Holyhead Railway," was placed before the directors of the London and Birmingham and the Grand Junction Companies, but while they formed a very high opinion of the project and desired to see it brought into practical operation, they considered the undertaking to be so vast that they could not entertain the idea of carrying out such a gigantic work themselves. Mr. Stephenson next decided to form a new company called the Chester and Holyhead, and after many delays and much opposition, an Act was obtained, incorporating the company, and authorising them to build a railway from Chester to Bangor, and from Llanfair to Holyhead. The part dealing with the crossing of the Menai Strait was thrown out, chiefly, it would seem, through the opposition of the Admiralty.

The presence of a rock in the centre of the Menai Strait enabled the plan of a bridge in two sections to be adopted, otherwise it would have been impossible to construct a bridge with an unsupported span of at least 1,000 feet. Mr. Robert Stephenson had therefore decided to construct two cast-iron arches, each having a clear span at the base of 350

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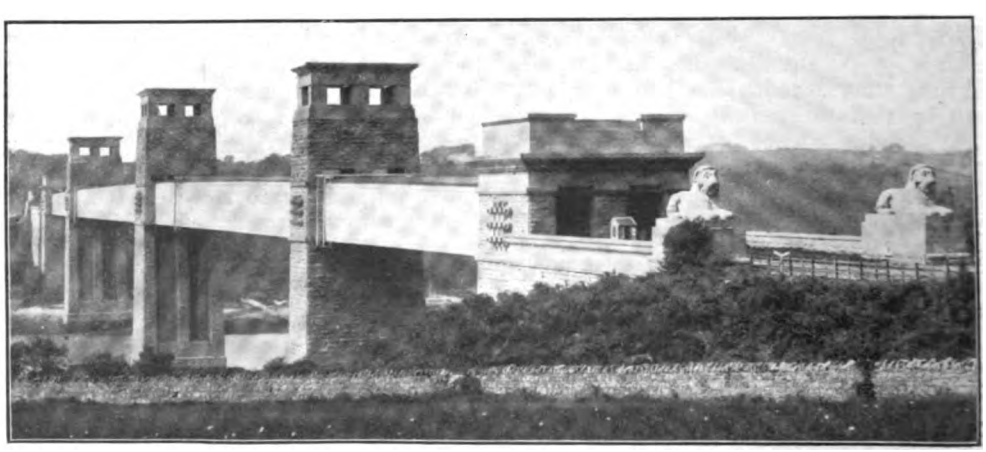
feet, and the level of the rails was to be 105 feet above high water mark at spring tides. One would have thought that this would have been sufficient, but the Admiralty said that the passage of ships would be impeded, owing to the bridge not being high enough and wide enough to clear their masts and rigging, regardless of the fact that few, if any, large ships go through the Menai Strait. The officials required each span to be of 450 feet, and the height to be 105 feet above the water for a length of 370 feet in each case. Hence the directors were forced to see what could be done towards building a bridge under such drastic conditions.

It is not the place here to fully describe the experiments which were necessary and the final outcome of them, neither the construction of the Britannia Bridge; so it may briefly be said that, following the design employed in crossing the Conway River, Robert Stephenson decided to use two huge hollow iron girders, through which the trains would run.

Eventually the Act for the building of the Britannia Tubular Bridge received the Royal Assent on 30th June, 1845, and the first stone of the bridge was laid on 10th April, 1846, by Mr. Foster, the resident engineer. The last piece of masonry work was done by Mr. R. Stephenson, who placed the final stone in position on the top of the Britannia Tower on 22nd June, 1849; but the bridge was not completely finished until October, 1850.

Curiously enough, the first railway train to run in Anglesey started from Holyhead, in the adjacent Holy Island, and took an easterly course to Llanfair. Why this should have been the case is an interesting matter which must now be explained. It was intended to commence the railway service between London and Holyhead on the 1st August, 1848, by running a train from Euston Square to Bangor, then conveying the passengers by coach over the intervening 3½ miles and across Telford's Suspension Bridge to Llanfair, whence they would travel by train to the terminus at Holyhead. As the Britannia Tubular Bridge was not yet finished nor available for traffic, the difficulty was how to get the necessary railway engines and carriages to the island. The directors of the Chester and Holyhead Railway solved the problem by giving an order to the Vulcan Foundry, of Newton-le-Willows, for the construction of three engines to be delivered in working order at Holyhead. These were sent in parts by sea to Holyhead, landed, and there erected. The carriages and wagons arrived by the same route. Thus the first train started from Holyhead and ran to Llanfair—though probably it was not available for passengers—and was by this means in readiness to take up the service from that place.

The time-table which the directors of the Chester and Holyhead Railway had arranged duly came into operation on 1st August, 1848, and passengers were booked to Holyhead, Dublin, etc., for the first time by the train leaving Euston Square at 8.45 p.m. on the previous evening. At Bangor the passengers were transferred to coaches and taken by road to Llanfair, not a very pleasant proceeding in the middle of the night, especially if the weather was at all inclement. Travellers in those days, however, were as a



Photo] [*L.N.W.R.*

THE BRITANNIA TUBULAR BRIDGE OVER THE MENAI STRAITS.

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rule thoroughly well inured to such hardships, having been brought up under the tender mercies of the stage-coach, and at that date there were, of course, many places which were only accessible by such means. The road journey was of short duration, about half an hour, and Llanfair having been reached, the passengers entered the waiting train and were soon speeding over the island to Holyhead, at which point the boat was boarded and the journey continued to Ireland.

It had been decided, when the building of the bridge was commenced, that it would be advisable to complete the communication between the island and the mainland as soon as possible, and to attain this end work was concentrated upon the finishing of one tube. The one chosen was that upon the north side of the bridge, which was to carry the up line of metals. On Tuesday morning, 5th March, 1850, the work was so far advanced that it was possible to place the last rivet in its position. A local journal gives the following account of the proceedings:

"Those three powerful engines, the *St. David*, the *Cambria*, and the *Pegasus*, weighing nearly 100 tons, and possessed on the average of from 50 to 60 horse-power, started from Bangor at 6.30 a.m., bearing Union Jacks and flags of all nations, in order to effect the conveyance of Mr. Stephenson and his staff through the tube. Shortly afterwards, whilst a train of 300 tons of coal was being allowed to rest for two hours in the Carnarvonshire tube, Mr. Stephenson put in the last rivet, making the 2,000,000th, Mr. Mare, the contractor, assisting him."

The luncheon, usual on all such occasions, was partaken of at Bangor, and afterwards a special train, stated to consist of 45 carriages and wagons, made a pleasure trip to Holyhead and back. The train was hauled by the same three locomotives and Mr. Stephenson drove the leading engine.

Captain Simmons, the Government inspector, devoted two days to the examination of the bridge, and, all things being found satisfactory, gave the necessary permission for it to be opened for public traffic. The directors of the Chester and Holyhead Railway announced that "On and after Monday, the 18th instant, the Express and Mail Trains will pass through the Britannia Bridge. Passengers are now conveyed, without change of carriage, from London, Birmingham, etc., to Holyhead."

The original service is briefly summarised in the following table:

	s Irish Mail 1, 2	Irish Mail 1, 2	1, 2, 3 & Gov.	s Irish Boat Express 1, 2
	p.m.	p.m.		a.m.
Euston Square	5.0	8.45		9.0
		a.m.	a.m.	p.m.
Chester ..	10.25	3.9	10.35	2.55
	a.m.		p.m.	
Bangor ..	12.10	5.4	12.55	4.35
Llanfair ..	12.20	5.14	1.20	4.45
Holyhead ..	1.5	5.49	2.50	5.15

	s Irish Mail 1, 2	1, 2, 3 & Gov.	Irish Boat Express 1, 2	s Irish Mail 1, 2
	a.m.	a.m.	p.m.	p.m.
Holyhead ..	2.0	7.0	2.30	7.0
Llanfair ..	2.35	8.13	3. 5	7.35
Bangor ..	2.45	8.30	3.20	7.45
		p.m.		
Chester ..	4.40	1.0	5.0	9.40
	p.m.			a.m.
Euston Square	1.0	7.30	11.10	4.50

s These trains ran also on Sundays.

The 12.55 p.m. train from Bangor and the 7 a.m. from Holyhead were the only trains which called at the four intermediate stations in the island, thus giving a daily service of one train each way. A person could leave, say, Bodorgan, go to Bangor, and return home the same day, but it was impossible to visit any of these four stations and get back to the mainland in one day, as the up train left before the down had arrived. On Saturday, however, an extra train (1, 2, 3, Gov.) was provided, which left Llanfair at 9 a.m. for Holyhead, and returned thence to Llanfair at 5 p.m., calling at all stations on each journey.

The first train in regular booking to pass over the bridge was that which left Chester with the mails on Sunday night, 17th March, 1850. It left Bangor at 12.10 a.m. and Llanfair at 12.20 a.m. on the Monday morning and then proceeded with the Irish mails across Anglesey to the quay at Holyhead. A few months later in the same year—Monday, 21st October, 1850—the second tube was finished and made available for passenger and goods traffic, and the monumental work of Stephenson was thus brought to a triumphant termination.

It may here be mentioned that the whole of the stone-work employed externally came from Anglesey, chiefly the Penmon quarries. It is a form of limestone, sometimes called Anglesey marble. The interior stone was not required to be of such hardness, and red

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sandstone from Runcorn in Cheshire was used, this permitting easier working.

Sir F. B. Head, in his chatty volume, *Highways and Dryways*, thus describes the lions at each end of the bridge :

"The four colossal statues of lions—we must not compare them to sentinels, for they are couchant—which in pairs terminate the land ends of the abutments that on each side of the straits laterally support its approaching embankment—are composed of the same marble as the towers. These noble animals, which are of the antique, broken-nosed, pimple-faced Egyptian, instead of the real Numidian form, although sitting, are each 12 feet high, 25 feet long, and weigh 30 tons. Their appearance is grand, grave, and imposing—the position they occupy being 180 feet in advance of the entrances into the two tubes, which so closely resemble that over the drawbridge into a fortress that one looks up almost involuntarily for the portcullis."

Soon after the opening of the bridge a medal was struck which gave on the obverse a view of the Menai Suspension and Britannia Tubular Bridges. This is reproduced on page 237, and it shows the two bridges as seen from a point in Anglesey and looking in a north-easterly direction toward Bangor and the mainland. The medal, which was produced by Messrs. Allen and Moore, two noted medallists, is of large size, 2½ inches in diameter. It was published by J. Aronson, of Bangor, and is now somewhat difficult to obtain.

If examined carefully with a magnifying glass, it is possible to make out that the engine hauling the train which is seen emerging from the bridge has six wheels—leading, driving, and trailing—and that the tender has four wheels. The top of the firebox appears to be domed or rounded, something like engines of Bury's design, but this feature is not very distinct, and much reliance cannot as a rule be placed upon artists' ideas of railway objects. On the reverse the chief dimensions of the bridges are shown in contrast, and it may be of interest to reproduce the figures which are there given :

DETAILS OF THE BRIDGES.

SUSPENSION.

Total length	910 ft.
Height of roadway above high water	100 ft.
Height of the two main pillars	153 ft.
Suspended weight of iron	480 tons.
Total weight of iron	2,186 tons.
Extreme length of chain	1,714 ft.

TUBULAR.

Total length of tube	1,513 ft.
Height above high water	102 ft.
Height of the two land towers	203 ft.
Do. centre towers	221 ft.
Weight of each of the four large tubes	1,800 tons.
Do. small tubes	700 tons.
Total weight	10,000 tons.

In addition it may be of interest to note that from the Carnarvon abutment to the Carnarvon Tower is a clear span of 230 feet, entirely over the land. From there to the Britannia Tower is a span of 458 feet 8 inches, the tower being built on a rock in the centre of the stream. Thence to the Anglesey Tower the distance is 459 feet 3 inches, and from there to the Anglesey abutment 230 feet, nearly all of which is over land. The measurements are to a certain extent approximate, as the length of the bridge varies from hour to hour, according to the temperature, the range being about four or five inches.

In September, 1851, the new station at Holyhead and the extension lines to the harbour were opened for traffic. The train service between Bangor and Holyhead which was then put into force is shown in the appended time table :

	1, 2, Mail.	1, 2, 3, 4.	1, 2, 3.	1, 2, Ex.	1, 2, Gov.	1, 2, Mail.
	a.m.	a.m.	p.m.	p.m.	p.m.	a.m.
Bangor	5.4	9.0	12.48	4.35	8.0	12.10
Britannia Bridge	—	9.7	12.55	—	8.15	—
Llanfair	5.19	9.15	1.15	—	8.35	—
Gaerwen	—	9.26	1.28	—	8.48	—
Bodorgan	—	9.41	1.46	—	9.6	—
Ty Croes	—	9.51	2.1	—	9.21	—
Valley	—	10.5	2.12	—	9.32	—
Holyhead	5.49	10.15	2.25	5.15	9.45	1.5

	1, 2, Mail.	1, 2, 3.	1, 2, Gov.	1, 2, Exp.	1, 2, 3, 4.	1, 2, Mail.
	a.m.	a.m.	p.m.	p.m.	p.m.	p.m.
Holyhead	2. 0	7.30	12.15	2.40	4.45	7.0
Valley	—	7.40	12.25	—	4.55	—
Ty Croes	—	7.55	12.40	—	5.10	—
Bodorgan	—	8.7	12.52	—	5.22	—
Gaerwen	—	8.23	1.8	—	5.38	—
Llanfair	—	8.33	1.18	—	5.48	7.30
Britannia Bridge	—	8.43	1.28	—	5.58	—
Bangor	2.45	8.50	1.35	3.30	6.5	7.35

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Photo] [*L.N.W.R.*

THE COMMEMORATION ARCH ON THE ADMIRALTY PIER AT HOLYHEAD.

On Sundays the 5.4 a.m. and 12.10 a.m. (Monday morning) down trains ran as on week-days, but a fourth class carriage was attached to the latter. In the up direction the service comprised the 2 a.m. (with a Government and a fourth class vehicle attached) and the 7 p.m. trains from Holyhead. These were, as in the case of the down service, simply the mail trains, run to a large extent for the postal requirements and no provision was made for travelling within the limits of the island on that day.

The fares at that period were as follows:

Holyhead to	Miles.	Mail and Express. 1.	Mail and Express. 2.	1.	2.	3.	4.
		s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Valley	3½	—	—	0 6	0 3	—	0 2
Ty Croes	9	—	—	1 1	0 9	—	0 4
Bodorgan	12	—	—	1 6	1 0	—	0 6
Gaerwen	18	—	—	2 3	1 6	—	0 9
Llanfair	21	5 0	4 0	2 8	1 9	—	0 10
Britannia Bridge ..	22¾	—	—	3 0	1 10	—	1 0
Bangor	25	6 0	4 6	3 3	2 1	—	1 1

In the fare list shown in "Bradshaw" of that period no figures are given under the heading of the third class, so it is rather uncertain whether third class passengers paid the second or fourth class rates, and in which vehicles they rode. The second class fares, it will be noted, are at the rate of one penny per mile, or an equivalent of the Government or Parliamentary rate. Throughout the early time-tables of this company there seems to be a looseness and ambiguity in employing the terms, Government, third, and fourth class; though in practice the passenger was probably very carefully looked after to ensure that he rode in his proper class and train and not in anything superior to that to which he was entitled. First class fares were reasonable, but the charges for travelling by the mail and express trains seem disproportionately high at the first glance. The actual rate, however, is not far from the old-time standard of twopence per mile for second class and threepence for first class accommodation.

As the years passed by the train service in Anglesey gradually developed until the present time-table was reached, but it will not be necessary to give that in detail, and a short statement of the present service of

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trains in connection with the Irish steamers will probably meet all requirements :

	Mail.	Night Express.	Mail.	Day Express.
	p.m.	p.m.	a.m.	p.m.
Euston .. .. .. dep.	8.45	10.15	8.30	1.20
	a.m.	a.m.		
Crewe .. .. .. dep.	12.7	1.25	11.48	—
			p.m.	
Chester .. .. . dep.	12.41	—	12.23	5.0
Holyhead .. .. arr.	2.17	3.30	2.5	6.55
	Sleeping Saloons.	Sleeping Saloons.	Breakfast and Luncheon Cars.	Luncheon and Dining Cars.

	Mail.	Night Express.		Mail.	Day Express.
	a.m.	a.m.	a.m.	noon.	p.m.
Holyhead .. dep.	12.22	2.0	2.15	12.0	5.30
				p.m.	
Chester .. arr.	2.0	—	4.8	1.45	7.6
Crewe .. .. ,,	2.37	4.4	—	2.23	7.43
Euston .. ,,	6.10	—	—	5.40	11.0
	Sleeping Saloons.	Sleeping Saloons.		Luncheon and Tea Cars.	Tea and Dining Cars.

These trains are run solely for the Irish service, and as a rule do not call at any stations in the island. The one exception is the day express from Euston, which stops at Gaerwen at 6.27 p.m. and leaves three minutes later. Usually a non-stop run is made between Chester or Crewe and Holyhead, and beyond the train specially mentioned, the only exception is the 2.15 a.m. from Holyhead, which calls at Bangor (2.50–2.53 a.m.) and then proceeds to Chester. The needs of the stations between Llanfair and Holyhead are met by a service of 11 trains in each direction daily, most of which stop at all stations. An additional train is run from Holyhead on Monday and Tuesday mornings, and a market train on Saturday evenings. In the other direction an extra train leaves Bangor on Thursdays for Gaerwen, and another on Friday evenings for Holyhead.

(*To be continued.*)

Photo] [*L.N.W.R.*

A STRIKING VIEW SHOWING ONE END OF THE BRITANNIA BRIDGE.

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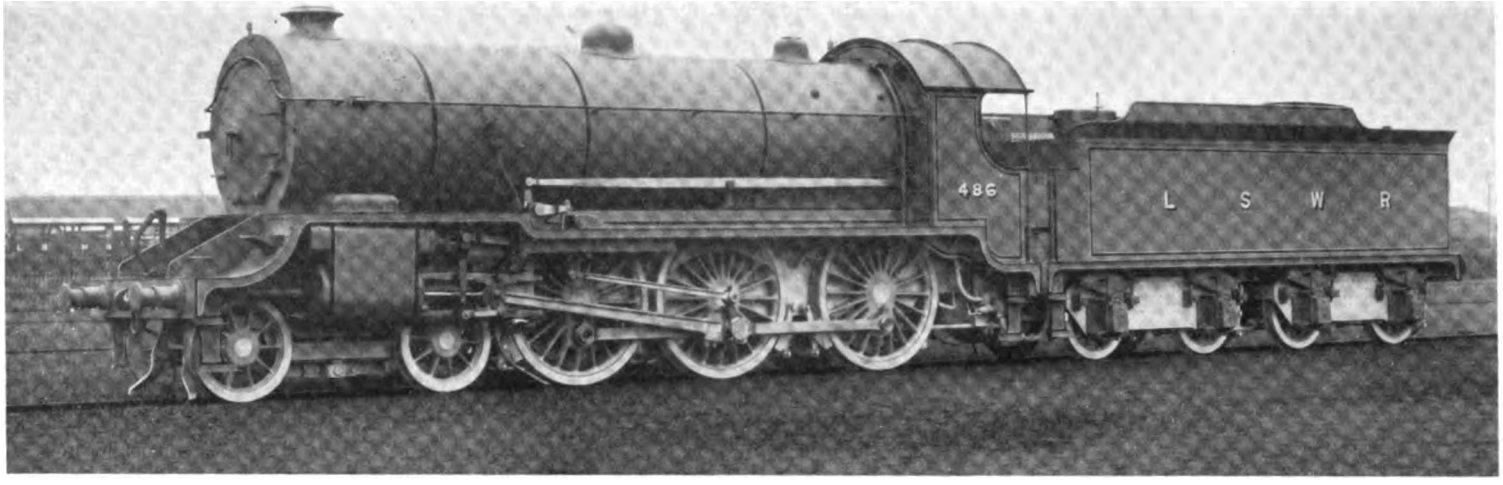
New 4-6-0 Superheater Mixed-Traffic Locomotive: London and South Western Railway.

Designed by Mr. R. W. Urie, Chief Mechanical Engineer.



In a recent number of the RAILWAY MAGAZINE particulars were given of the new 4-6-0 mixed-traffic engines then under construction at the Eastleigh Locomotive Works of the London and South Western Railway, to the designs of Mr. R. W. Urie, chief mechanical engineer. We now illustrate the first engine of this class, already in service. In addition to features previously reviewed, attention may be directed to the fact that the tender bogies have outside axle boxes, a marked change from the practice of the late Mr. Dugald Drummond. Of the ten engines, Nos. 482-5 have Schmidt superheaters, Nos. 486-9 Robinson superheaters, and Nos. 490-1 use saturated steam. The respective heating surfaces are as follows:—

SCHMIDT SUPERHEATER: Small flue tubes, 1,252 sq. ft.; large flue tubes, 507 sq. ft.; firebox, 167 sq. ft.; total water surface, 1,926 sq. ft.; superheater, 394 sq. ft.; total, 2,320 sq. ft.

ROBINSON SUPERHEATER: Small flue tubes, 1,252 sq. ft.; large flue tubes, 464 sq. ft.; firebox, 167 sq. ft.; total water surface, 1,883 sq. ft.; superheater, 371 sq. ft.; total, 2,254 sq. ft.

SATURATED STEAM: Tubes, 2,025 sq. ft.; firebox, 167 sq. ft.; total, 2,192 sq. ft.

The grate area is 30 ft.; working pressure, 180 lb. per sq. in.; cylinders, 21 in. by 28 in.; bogie wheels, 3 ft. 7 in. diam.; coupled wheels, 6 ft. diam.; boiler barrel, 5 ft. 6 in. diam. at smallest ring, 13 ft. 9 in. long; firebox, 9 ft. long; engine wheelbase, 26 ft. 7¼ in.; coupled wheelbase, 13 ft. 9 in.

The tender is carried on 3 ft. 7 in. wheels over a wheelbase of 19 ft.; and holds 5,200 gals. of water and 7 tons of coal. Total length of engine and tender over buffers, 65 ft. 6¾ in.

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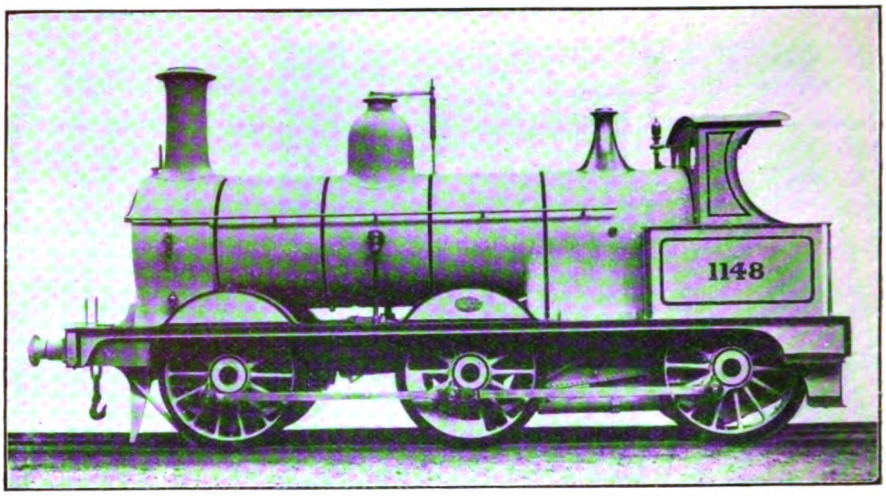

GOODS ENGINE DESIGNED BY MR. S. W. JOHNSON FOR THE MIDLAND RAILWAY CO. AND BUILT BY MESSRS. KITSON AND CO., OF LEEDS, IN 1876.

The spaces between wheels indicate that these engines were built before steam brakes were applied. The absence of rivet heads and protruding bolts affords facility for easy and effective cleaning, and in the long run is a commendable feature.

Leaves from the Log of a Locomotive Engineer [No. XVIII.].

By ROBERT WEATHERBURN.

ONCE again in the good old smoke begrimed atmosphere of Leeds, with its bustle and mechanical enterprise, more strongly illustrative of the value of varied industries than any other town in England. Then for a short period on the Taff Vale Railway with engines built to the design of the late Mr. Hurry Riches, yet embodying certain features suggested by the firm of Kitson & Co. After that once more on the Midland Railway with engines built to the design of Mr. S. W. Johnson who during my absence in the north-east of Europe had been appointed as the successor of Mr. Matthew Kirtley, deceased. Under the auspices of the most powerful Chairman the Midland Company had had up to that time, Mr. Edward Shipley Ellis of Leicester, the new and capable engineer was given a latitude and power rarely enjoyed by a Locomotive Superintendent, and many and far-reaching were the changes then in operation.

No doubt this was largely due to the stimulating yet invigorating policy inaugurated by that masterly administrator, Sir James Allport. There is no Company in Great Britain which possesses a reputation so rich in innovations as the Midland Railway, the first to introduce the luxury of travel in the shape of Pullman Cars, the first to concede to the public the privilege of 3rd class in all trains, a boon to the then travelling public of such a kind as cannot be understood by the present generation.

The daring abolition of the 2nd class was the forerunner of an ardent desire to equip the line and engines with every device that could ensure safety and control and popularise the company.

This forward policy acted as a healthy stimulus to other and, more particularly, competing lines. Several of the American railways had adopted power brakes, and the North London had been using the chain brake for some time. George Westinghouse, the inventor of the brake bearing his name, was pushing his invention to the fore in this country. Already that admirable brake was adopted by the London Brighton, & South Coast and North Eastern Railways and several others, and success seemed assured; but the Vacuum brake, of mixed genealogy, was taken in hand by a small

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band of ingenious men, who nursed it through the most critical periods, amidst storms of abuse and opposition, until, freed from many of its primal defects, it took its stand as an opponent to the so far victorious Westinghouse. This was largely due to Mr. S. W. Johnson, Locomotive Superintendent, and Mr. Clayton, Carriage and Wagon Superintendent, Midland Railway, the latter gentleman being the inventor of the brake coupling now in general use on all Vacuum brake trains.

It would not be consonant with this account to pursue the subject much farther as it has already become history, but a brake was required in lieu of the hand brakes, and without the auxiliary pump or engine which is a feature of the Westinghouse. Kitson's supplied the first steam brake fitted to a four wheeled coupled engine. It was tried on the Ilkley line, and was so powerful, or so injudiciously used, that the tyres of the engine expanded under the friction to such a degree that a penny piece could be inserted between the rim of wheel and tyre. A further modification corrected this evil, and I ran the Kitson "Batchelor" brake with more or less success until its gradual evolution took the correct form. The steam cock was afterwards so arranged and improved upon by Mr. James Gresham of Manchester, as to act alone or in conjunction with the Automatic Vacuum Brake.

I have so far dealt with this question as it was through these and other experiments that I was brought in such close personal contact with Mr. Johnson that eventually I accepted a minor official position on the Midland Railway under his supervision at Burton-on-Trent, as assistant to Mr. T. Ryder. I parted from the old firm with considerable regret and, like a badly weaned child, would have returned if my pride would have permitted. There are in every condition of life features and incidents worthy of recital, but in the new phase of my career I found the discipline most irksome. The system of reporting every event of importance, and of passing such reports through the intermediate stages, was almost intolerable until it became a habit.

Mr. Ryder was the best man at breakdowns I had met with since leaving South Wales, and minor mishaps were of frequent occurrence at that time, as the line was pretty considerably flooded with traders' wagons which were not always built up to the standard of the Company's own stock.

At that time the vast sidings at Burton and the neighbourhood were prolific of derailments of both engines and wagons, and although the great majority could be promptly dealt with, there were at times some of a very irritating character caused by barrels being flung out of low-sided wagons and getting under the vehicle, the result of rough shunting. One would hardly think that such objects would be capable of supporting impact and weight under these conditions, but when one considers the shape and form as being very resistant, there was no wonder that light wagons were canted and pitched into awkward positions which rendered their extraction, if not a difficult, at all events an irritating task. But Mr. Ryder was the right man: he simply revelled in a big accident and nothing pleased him more than a good smash-up. His acerbity of temper, coupled with an uncompromising sense of duty, made him somewhat unpopular, but by those who knew his many good qualities he was held in esteem. He was one of the old school of mechanics, and among his most cherished friends was Mr. T. Cressey, at one time the Chief Engineer and expert for the firm of Bass, Ratcliffe, & Gretton.

Cressey was held in high respect in Burton on account of his ingenuity and general ability as a mechanical engineer. He was the first to attempt to make barrels by machinery, and naturally incurred considerable ill-feeling from the large body of hand coopers. Owing to some disagreement he left the firm of Bass, Ratcliffe & Co., and eventually commenced business on his own account. For years in a small way he enjoyed the patronage of several minor breweries. After business hours Cressey and Ryder were inseparable companions, and shared each others confidence. No better and straighter types of the old school could be found.

I remember an interesting incident which occurred in which I took part. Cressey had visited Ryder on two occasions at the sheds, and on both Ryder had accompanied him back. On the day following Ryder informed me that Cressey had been called in by a well-known brewery firm to examine their engine which had a peculiar and disagreeable knock, which had baffled all attempts to locate, and concluded by saying "as there was wisdom in plurality of heads, would I go down and see it." On our arrival I examined the engine carefully. It was of the horizontal type, between thirty and forty horse-power. The engine was started and ran smoothly up to a certain speed, but, beyond that, thumped

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alarmingly. Cressey, whose reputation was at stake, told me that he had examined the engine everywhere, but could find nothing wrong. Everything that I could think of had already been done. The knock was such as would be caused by the piston head striking the cover. Being however assured that there was plenty of clearance, I left after suggesting that the drain taps might be examined.

Mr. Ryder the following day informed me that Cressey was in high glee, as he had had a dream during the night in which the exact fault had been revealed to him and that he intended remedying it that day. I was naturally anxious to know what the difficulty was, as I had felt some annoyance at being unable to assist in the matter. A couple of

MR. THOMAS RYDER,
Late District Locomotive Superintendent, Midland Railway, Burton-on-Trent and District.

MR. THOMAS CRESSEY,
Formerly Chief Engineer, Bass, Ratcliffe and Co., Burton-on-Trent.

days later I enquired how Cressey was progressing after his vision. "Oh!" remarked Ryder with an air of disappointment, "He went to the place he had seen in his dream, and made an alteration." "And the result?" I asked impatiently! "Why I think it knocks worse than ever" he replied, "Will you go and look at it again?" I agreed, and on the way studied the question closely.

On my arrival I could see by Cressey's looks that he was in a bad way, and I walked alone into the boiler house, and at once noticed that the boiler was domeless, the steam being taken through a junction valve mounted on a flanged pediment not more than fourteen inches above the crown of boiler. With awakened interest I examined the positions of the boiler flues and the height of water gauge cocks, and in a moment the idea flashed through my mind that the engine was much too large for the work it was doing, and having a massive fly wheel and old-fashioned governors, was as a consequence overrunning itself, thus causing a suction or capillary action on the boiler. Thoroughly imbued with this idea I went to Cressey and enquired whether he had examined the boiler. "No! Why should I examine the boiler?" was his reply.

I explained my reasons, which he by no means endorsed, and after some little difficulty got him to promise the experiment of a temporary sheet iron T-shape pipe, about six feet long, crenellated at the top, and to be fixed in the aperture of the steam way in the boiler with the object of distributing the intake of steam over a larger area. The result was the engine ceased knocking. His gratitude knew no bounds. He afterwards offered me one half the fee he received. I refused it knowing that his life was a succession of severe trials, and that little credit was due to me for the fugitive idea. Nevertheless I had my reward, for to the day of his death I enjoyed his close friendship.

Whilst at Burton I received a letter from the office of Messrs. Ferguson & Ashwell, Victoria Street, Westminster, at that time Crown Agents for the Queensland Government, asking me to meet Mr. Ashwell, suggesting at the same time, three days hence, at one o'clock, at the Midland Hotel, Derby. Subject—"Important business." Mr. Ashwell, who was a giant in stature, asked me whether I was willing to take over

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the inspection of some narrow gauge locomotives then being built at the Vulcan Foundry, Warrington, and the Bristol Engineering Works, formerly Stodhart & Slaughter of Bristol, for the Queensland Government Railways, the engines designed by Robert Fairlie. I told him it was impossible for a Midland employee to take over other work, moreover, it would not be just to my new chief, Mr. S. W. Johnson. I advised him to obtain the services of some other inspector. "No! we want you!" he answered. "You were with the Kitson engines in competition against Fairlie in Russia; we know all about it, and as Mr. Fairlie has persuaded the Queensland Government, against our advice, to adopt the narrow gauge, we still retain the right of inspecting the work in England, and intend to exercise it justly, but firmly. The Queensland Government have fallen into a grave error in taking up the narrow gauge, which they will in time bitterly regret, but at all events we are determined that the material and design so far as possible shall be satisfactory. If you agree I will see Mr. Johnson and borrow your services."

With some reluctance I gave my consent. Four days later, through the medium of Mr. Ryder, I received a letter from Mr. Johnson informing me that he had placed my services as inspecting engineer at the disposal of Messrs. Ferguson & Ashwell, Crown Agents of the Queensland Government, for two, three, or four days a week, as the case might be, and that on those days my services should no longer be credited to the Midland Railway. In due course, armed with the required credentials, I presented myself at the Vulcan Foundry, Warrington, and was received by Mr. Gooch the managing director, son of Sir Daniel Gooch, and brother of Mr. J. V. Gooch, whom I had known and done some little business with in Riga, when he was engineer for the Constantinovsky & Alexandrovsky Railway.

By repute the Gooches were always esteemed as gentlemen. Of the father I cannot speak, but the sons, in business and deportment, amply merited that often misapplied title. After a few business courtesies Mr. Gooch passed me into the hands of the Works Manager, Mr. Brutelle, brother-in-law to Mr. Johnson, whose name I had been familiar with from a boy, when he was draughtsman at E. B. Wilson's "Railway Foundry," Leeds. Together we passed through the old historic shops, formerly Tayleur's, the past history of which, and the estate belonging thereto, would be of uncommon interest if written by one familiar with its unique character.

The tender shop was the last visited, the foreman of which, anticipating the formality of introduction, and ignoring the presence of Mr. Brutelle, came up and seizing me by the hand exclaimed "Nah lad, awm glad t' see tha mon. Tha knaws owd Frank Spinks, 'Awd limestone en flint.' Mr. Brutelle, last time I seed this gradely lad war in Russia." I looked on the rugged features of the Lancashire "mon," whom I had last seen for a few minutes in the railway buffet at Witepsk, when on his way from Riga to Constantinovsky. On the occasion in question, I had taken advantage, whilst travelling between Moscow and Riga, to break my journey at Witepsk in order to visit my old acquaintance, Mr. S. Betts, late Chief Mechanical Engineer on two Swedish Railways. Any little event that has a tendency to enliven the dull hours of a winter day in Russia is welcome, and Betts proposed that we should walk to the station, and see the train come in from Riga on its journey to the South, as 20 minutes were allowed for refreshment and warmth.

At that time very few of the trains were heated, or, if heated, very imperfectly. Ordering two glasses of tea with lemon, we were just in time to see the inrush of the frozen passengers, clamouring and shouting for tea and coffee. Among them, and more noticeable than all others by the absence of fur coat and any other seasonable apparel against the cold beyond a thick heavy pilot jacket, with a shawl wrapped around his neck, stamping his feet, and elbowing his way to the counter, I recognised old Frank. In a moment I explained to Betts that this was the Spinks of whom he had heard previously. By this time he had been supplied with a glass of vodka and was asking in English how many "Pecops" he had to pay. This new and unexpected pronunciation of "Copecs" produced a burst of merriment from myself and Betts, which Frank, not in the best of humour at not being understood by the waitress, resented by turning round quickly, when his anger was immediately mollified by the pleasure of our unexpected meeting. We did the necessary interpreting for him, and after giving him all the information we could as to his long and tedious journey, bade him adieu. His last remarks were strongly in keeping with the man, and, minus the vernacular, were:—"I don't know where the place is, but I've a heart of

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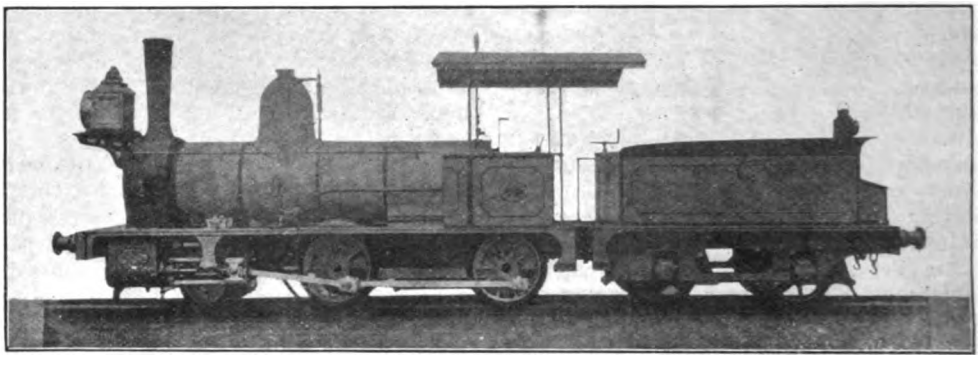
limestone and flint, and I'll get there somehow."

Yes, it was old Frank, still in the flesh, in spite of the report of his death at Alexandrovsky. His rough and rude peculiarities, and ignorance, or disregard, of courtesy were well-known, but he was nevertheless respected, and even liked, and during my repeated visits to the Vulcan Foundry, at times of a trying and exacting character, I felt that much of the genial and kindly feeling shown me was due to old Frank Spinks. He was a first class workman in his day, and had enjoyed the personal friendship of Sir William Fairbairn, whose locomotive works were at time well-known in Manchester.

Vale! Frank, despite your boorish uncouthness you at least embodied a principle fast dying out among English workmen, namely an unswerving loyalty to your master's interests, even when disastrously placed



NARROW GAUGE LOCOMOTIVE DESIGNED BY MR. ROBERT FAIRLIE FOR THE QUEENSLAND GOVERNMENT RAILWAYS, ORDERED 1877, AND BUILT BY THE VULCAN FOUNDRY CO.

and harassed by adverse circumstances; that, and your bulldog courage, stand to your credit. When I saw the *arcus senilis* portent in his eyes, I knew, notwithstanding the "limestone and flint," that his days were numbered.

Twenty-five years afterwards I heard from an Australian official source, that the engines to which I have referred although very faultily designed, did good service in consequence of the workmanship, and excellent material of which they were constructed, and in that respect upheld the reputation of Lancashire.

Few people remember or have even heard tell of the firm of Stodhart & Slaughter, the Bristol Locomotive Engineering Co., Ltd. To this firm, then under new management, I was in due course accredited, and after the usual introduction made the circuit of the works. The impressions that I received after a careful survey were that, however good the management might be, they were unable to compete successfully against the better equipped and disciplined firms such as Kitsons, Dübs, Neilson, etc.; but this was none of my business, only so far as the quality of the workmanship was affected by the use of semi-obsolete machinery. The boiler making was not up to my ideas of what was good. The machine rivetting was anything but satisfactory, as was evidenced by sample rivets taken out. The plating and joining up of seams left much to be desired, necessitating a too liberal use of caulking tools. The system of erecting, too, did not allow of that care which tells its tale in the life history of a locomotive. The one good thing that I regarded with satisfaction was the excellency of the forgings, which were made from the best scraps I had ever seen, namely, old horseshoes. Their system of casehardening, although not extensive, was good. The design of the engines was, in general features, passably good, but in details showed a lamentable indifference to, or ignorance of, working maintainance.

In every large engineering works there is always one man who is the "Vade Mecum." In any dispute, difference, or difficulty regarding drawings or designs, he becomes the referee. If the engines are designed by the firm, he is responsible; if not, he is at least responsible for placing the supplied design in an intelligible form before the several departments. If not the designer, he becomes the interpreter of the design to others. I have met many chief draughtsmen, both in the firms and railway works. They are always the most interesting and hard-working of the staff, more particular in building firms, which by reason of greater

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variety of work produce more able men. Everything relating to a firm in the way of plans and new designs has to filter through the draughtsman's brain; with him, if a good man, there is no negligible quantity. In the case of railway works, the chief draughtsman requires to be a man full of suggestions, and a careful annotator of the weak points and difficulties that come under his notice. He also becomes the recipient of other men's experience and practice. To such as him much of the credit is due, although reaped by others. I do not make any particular claim for the chief draughtsman at Stodhart & Slaughter's beyond being a real entity. An indefatigable worker was Mr. Widmark, a Swede by birth and training, most capable as far as his experience went. Together we examined the drawings supplied by Fairlie, who at that time, I believe, was the responsible head of the "Fairlie Narrow Gauge Rolling Stock Company, of London."

My instructions conferred upon me the power not only of objecting to bad work and material, but also to attack any part or detail of the design which I considered not safe, or really objectionable in modern practice. A glance was sufficient to show that many of the details had been dealt with by men who had no lengthy railway experience, and these, if allowed to be put in practice, would develop faults and weaknesses which would militate against economical up-keep in the colony. When studying the details of fire boxes I was struck with the peculiar form of the radial staying on the curved crown; the stays were to be made of copper screwed through both shell and crown plates, rivetted at an awkward angle at top, and fastened with nuts inside the crown. I objected at once both to the copper and the pitching of stays, and requested that further progress of the work should be stopped until I had communicated with the Government agents. The work's manager informed me that he could do nothing until the arrival of Mr. W—— the managing director, remarking that the margin of strength was ample, and moreover the work being well in hand, they considered my objections somewhat too stringent. After communicating with the agents, they agreed wholly with my views, and instructed me to be firm.

The Managing Director on his arrival very courteously "pooh poohed" my objections, and ordered the work to be pushed on. I was duly advised that the boilers would be tested on a certain date, and on my arrival found all in readiness. The stipulated trial pressure was 140 lbs. steam and 200 lbs. water, I made the needful gauges for trammelling any deflections of the crown, and carefully gauged the normal height of crown plates on the sides, and from foundation rings of the firebox. I insisted on the proviso of heating the water to 212°, then dropping the fires and filling up by means of a hydraulic pump, thus getting the whole boiler to a temperature approaching that of normal working. When I again tramelled carefully for testing, but before giving instructions, I told Mr. W—— that in my opinion the crown would show a permanent deflection. "Not at all" was the rejoinder. The pressure was then applied and no visible alteration was detected until 175 lbs. was registered on the gauge, when the sharp point of the hooked trammel passed the datum mark by $\frac{1}{64}$ in., at 180 lbs. it was $\frac{1}{32}$ in., at 190 lbs. it was $\frac{1}{8}$ in. From the inside of the hot firebox I shouted the result. "Oh! never mind, it will recover" said Mr. W——. The next few strokes brought it down to a quarter of an inch, and on hearing this they stopped the pumping, and as the pressure gradually leaked off there was no recovery; we had passed the limit of elastic recovery; as I had anticipated the centre stays had yielded that amount. Mr. W—— had nothing further to say, but, after communicating with Mr. Fairlie, my objections were over-ruled. No doubt they contented themselves with the belief that it was a permanent set. The agents were, however, satisfied.

I heard afterwards that the middle stays were taken out and best Yorkshire iron substituted, which I had strenuously advised at the first.

(*To be continued.*)

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The New General Manager, Great Eastern Railway.

Photo] [*C.N.*

Mr. Henry W. Thornton,

At present General Superintendent, Long Island Railroad.

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The New General Manager of the Great Eastern Railway.

IN appointing Mr. Henry W. Thornton, General Superintendent of the Long Island Railroad, to be General Manager of the Great Eastern Railway in succession to Mr. Walter H. Hyde, the directors have initiated a daring departure from usual methods, especially when it is borne in mind that conditions, traffic, law, procedure, trade and industry differ so much from those which apply in the United States of America; but Mr. Thornton, though relatively a young man, 41 years of age, has a good record of service behind him, and has displayed special capabilities as an executive railway officer, combining strong technical, traffic and administrative qualifications.

Serving the Brooklyn district, that portion of Long Island which constitutes the eastern suburbs of "Greater New York," the Long Island Railroad carries a large volume of heavy and difficult suburban traffic, in which respect a good comparison is made with Great Eastern conditions. Certain sections are electrically equipped, so that Mr. Thornton's experience in this connection will be of value, if, and when, the problem of electrification of suburban lines becomes a vital one on the Great Eastern. As a long distance railway the Long Island Railroad hardly ranks as one of the biggest lines; but it serves virtually the whole of Long Island, and has considerable mileage, dealing with a variety of traffic, and is not altogether dissimilar to the Great Eastern system.

During his recent visit to this country, Mr. Thornton created a very favourable impression, and he is assured of a warm welcome from other railway officers. He will have a difficult task for some time, to appreciate all the ramifications and peculiarities of British traffic; but in due course we may expect interesting results from the combination of capable American experience and good management based upon British conditions.

In making the announcement of Mr. Thornton's appointment, Lord Claud Hamilton suggested that the selection of an American railway officer for the supreme executive position was due to the dearth of gentlemen possessing the necessary qualifications in this country. This dictum can hardly be accepted, seeing that British railway officers are in considerable request in many parts of the world, while they are not unknown on railways in the United States, notwithstanding the essentially different conditions which apply there, and this in spite of the alleged fact that British railway conditions do not provide an ideal training ground for all-round officers.

However, it is "up to" Mr. Thornton to justify the action taken by the directors of the Great Eastern Railway Company, and there is no reason why, when he takes up his new duties, and has become familiar with English traffic and methods, the outcome should not prove eminently satisfactory. We congratulate Mr. Thornton upon his selection to succeed Mr. Hyde, and look forward to a future which will do him, and the Great Eastern Railway, credit.

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PERTINENT PARAGRAPHS

The Railway Reports.

In view of the fact that the reports now being issued by the various railway companies, covering the twelve months ending December 31st, 1913, are the first compiled in accordance with the Railway Accounts and Returns Act, special interest attaches to their form and the information contained therein. Many more particulars are included than have hitherto been made available in this manner, and the reports are relatively voluminous publications compared with their half-yearly predecessors. Incidentally, their preparation has added considerably to the cost previously entailed, estimated in some cases at £1,000 or more additional. The difficulty of comparison with corresponding periods in earlier years is in most cases overcome by making no comparisons at all, though the comparative tables are prepared in skeleton ready for next year's reports. Practice in reference to interim dividends declared for the first six months of 1913 has varied considerably. Some companies approximated to what would have been done under the old conditions, others adopted a small figure, leaving the bulk of the profits to be accounted for in the annual report. A few companies declared no interim dividends. It is worthy of note that the Wirral Railway Company went even further, issuing a report in the new form for the six months ending June 30th and holding a half-yearly meeting as in previous years. This example was not followed in any other instance. On the whole the situation revealed by the reports now available for consideration is a satisfactory one. In several instances attention is drawn to the fact that short distance, and particularly intermediate suburban traffic, has fallen off, no doubt due to the increased tramway and motor omnibus facilities now afforded in many districts; but on the other hand, increases in outer-suburban and long-distance traffic are usually announced. The change in accounting methods has entailed many difficulties, and it is notable that so many of the reports have appeared as early as they have, while in the case of the South Eastern and London, Chatham and Dover Companies, and the Managing Committee, almost a record was achieved in holding the annual meeting of the shareholders as early as February 4th. In future years these difficulties will not be so serious, as the new conditions will become normal. Not the least valuable feature of the reports is the inclusion in each of a carefully prepared map showing owned, leased, and joint lines, and the sections of other railways worked over.

* * *

Resignation of Mr. Walter H. Hyde.

The news that Mr. Walter H. Hyde is retiring from the General Managership of the Great Eastern Railway came as a great surprise, and there can be no question that he will be missed at Liverpool Street. During his four years of office the Great Eastern Railway has developed considerably, and it will be remembered that for over six years previously he was Assistant General Manager, sharing the responsibilities with Mr. J. F. S. Gooday. The two offices together provide a good record of capable administration, covering a period which has by no means been devoid of difficulties. Coming from a railway family, Mr. Hyde commenced his business life with the Great Eastern Railway in 1877 as a youth in the Secretary's Department. After three years' experience of the general routine of a railway office he was transferred to the Accountants' Department, Mr. F. Waddy being then Chief Accountant. Here he obtained further experience, and at the age of 32 was appointed to succeed Mr. W. H. Peppercorne as Chief Accountant. Mr. Hyde was then the youngest officer in the service of the Great Eastern Railway, and his promotion to so important an office was a deserved acknowledgment of his ability. In 1903, Mr. Gooday, the then General Manager, desired the services of an assistant, and Mr. W. H. Hyde was chosen for the position. During the six years he was Assistant General Manager, many opportunities occurred for him to display the qualities and traits requisite in an officer destined to occupy the chief position. He frequently represented Mr. Gooday at the Railway Clearing House General Managers' Conferences, and was a delegate to the International Railway Congress at Washington in 1905. He also represented the Great Eastern Railway at the International Congress in 1910 at Berne. During the 1904–5 Session he was a lecturer on Railway Accounts at the London School of Economics and was a member of the Sub-Committee A of the Board of Trade Railway Conference, 1908–9. It will be seen that, although Mr. Hyde became the General Manager of one of our leading railways at the early age of 45, he had had thirty-one years' experience of practical railway work. When in America in 1905 he made an extended tour of the principal cities in the States and Canada, and closely watched the working of the railway traffic and the solution of railway problems in those gigantic countries. Despite the arduous nature of his professional duties, Mr. W. H. Hyde has made time to identify himself with the relaxations of the Great Eastern Railway staff. He has been President of the Liverpool Street Swimming Club since its inception in 1903, and was the first chairman of the Great Eastern Railway Musical Society. He has also been Chairman of the Finance Committee of the Woodford Urban District Council.

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City Companies and the Railways.

On Monday, January 26th, the Master and Wardens of the Worshipful Company of Carpenters entertained the Chairman and representatives of the leading British railway companies to dinner in their magnificent hall in London Wall, such an occurrence being, we believe, unprecedented, and peculiarly notable at this time when industrial and railway interests are supposed to be so conflicting. Mr. John Hooke (the Master) pointed out that the capital now employed by railway companies, exceeding 1,400 millions sterling, is more than double our National Debt. He offered a well-merited tribute to the business ability called for and evidenced by those responsible for the conduct of railway enterprise. Sir Gilbert Claughton, Chairman, London and North Western Railway Company, replied to the toast "Success to the Railway Industry of the United Kingdom and good health to its Controllers," and was followed by Lord Knaresborough (Chairman, North Eastern Railway Company), who referred to the fact that the ordinary revenues of Bulgaria, Servia and Greece have to be put together to about equal the revenue of the North Eastern Railway. Among other speakers were Sir Llewellyn Smith, of the Board of Trade.

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The Lancashire & Yorkshire Railway and the Conveyance of Cinematograph Films.

When it is remembered that in the counties of Lancashire and Yorkshire there is a population equal to one-fourth of the total inhabitants in England and Wales, it will be easily understood that in that part of the country there are probably more picture houses than in any other area of the same size. Within a radius of fifty miles of Manchester there is a population of upwards of ten million people, forming the most thickly populated and largest wage-earning class in Great Britain, and to meet the popular demand for either bi-weekly or tri-weekly changes of pictures it naturally follows that a large traffic in cinematograph films passes daily on the Lancashire & Yorkshire Railway, seeing that the system connects nearly the whole of the manufacturing and industrial centres of the two counties. Manchester, with its railway facilities, is, of course, the chief distributing centre for films for all parts of Lancashire, and it may be mentioned that within one minute's walk of Victoria station there are no less than fifteen film-renting agencies. The Lancashire & Yorkshire Railway Company are fully alive to the importance of a quick and reliable service for the conveyance of films. The packages are sent forward by the first available train after receipt from the senders; in fact, if it is desired that the films should be despatched by a particular train from Manchester, the messenger is given a permit enabling him to take the package to such train. Special care is exercised by the guards to see that films are put out at the proper junction or destination station, and at transfer points films are taken direct to the first connecting train. On arrival at destination station the films are immediately transferred to the parcels office, where possession may be obtained, or, if not applied for personally, are sent out for delivery by first van after arrival. Films required for a matinee performance in any part of Lancashire can be forwarded by an early morning train, and the sender and consignee may rest assured that they will be received in sufficient time for the performance. Another example of the special attention paid to the conveyance of films is the acceptance of packages on Sunday. The rates for the conveyance of this class of traffic are very reasonable, being no more than the ordinary charge made for other classes of traffic forwarded by passenger train. The films have only to be packed in wooden or metal cases, and despatched without any other covering. To ensure quick transit, the manufacturers and film-renting agencies provide a label which shows distinctly the name and address of the consignee, and the contents of the package.

LANCASHIRE & YORKSHIRE RAILWAY.
Messenger from one of the film-hiring companies delivering films at the Parcels Office, Victoria Station, Manchester.

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State Railway Management in South Australia.

OPINIONS are divided as to whether State management of railways is advantageous either temporarily or in the long run; and consideration of the subject is usually confused by the introduction of numerous issues which have nothing to do with the broad principle, and which are merely incidental to the particular conditions under review. For example, Continental experience is no guide to possible conditions were the home railways nationalised, if only because so many of the European systems have developed under State management, and in any case afford no real parallel with the present or probable situation in the United Kingdom. In Australia and elsewhere private enterprise might have created more favourable conditions than those which now apply, or the reverse might easily have been the case, owing to the character of the countries concerned, and the trend of territorial, industrial and commercial development. However, there is no need to labour these and other aspects of the situation, except to emphasise the fact that the policies of private enterprise and State ownership are far too complicated to permit of discussion on the basis of a few specific issues. An interesting view of the conditions which have been created in South Australia is afforded by a communication received from a reader in that section of the Commonwealth, and without necessarily associating ourselves with his remarks, his letter may be quoted as follows:—

"The Commissioner of Railways for South Australia advertised that on and from November 1st, 1913, the Broken Hill express would call only at Riverton, between Adelaide and Terowie. This would have been quite an innovation, as it meant a run of 63 miles from Adelaide to Riverton, followed by one of 76¾ miles from the latter place to Terowie without a stop. However, no sooner was the announcement to the above effect made public than there was a great outcry from various places along the line at which the train had stopped previously; petitions were signed and representations made to the Commissioner through the various members of Parliament, requesting that the train should not run through this place or that place, as the case might be, without stopping, and this in spite of the fact that the Commissioner had made arrangements for an extra train each way to serve the places at which the express did not stop. The result of this is that the train does not make the run as at first advertised, but now stops at Burra, 38¼ miles from Riverton, as it previously did. Yet we are told that the railways are entirely outside the influence of politics and that the Commissioner has as free a hand as the manager of any company-owned railway. At the present time the railways in South Australia would appear to be controlled by a sort of condominium (composed of the public and the railway Commissioner), in which the public hold the casting vote."

* * *

State Railways in India.

CONDITIONS in India favour the State acquisition of the railways, several lines being already operated by government, while in other cases the State has a much greater influence than is found on any of the home railways. At the ordinary general meeting of the Bengal and North Western Railway, Col. T. Gracey stated that the Secretary of State, in accordance with the contract, had given notice that he might exercise his option to purchase the company's railway in 1932 at a price fixed on the average earnings of the railway for the five years ended December 31st, 1912. The effect of this notice, together with the fact that the company's lease of their lines terminated in 1982, rendered it impossible for the company to raise or spend any more capital beyond what was required to complete works in hand, which were now almost finished. Unless some reasonable arrangement could be made with the Secretary of State, by which more money could be raised, the company must cease to pursue an active policy in developing the country and improving their lines, which must remain and be maintained as they now were till such time as the Secretary of State saw fit to take them over or resumed them at the termination of the lease in 1982 To obviate this position the board had been in negotiation with the Secretary of State for the past two years, but he was unable to tell the stockholders that the negotiations had made any real progress.

* * *

Modern Passenger Carriage Construction.

A LETTER from a Berlin reader, Mr. P. Weil, affords a good example of the fact that many of the closest students of home railway matters belong to other nations, his remarks being prompted by Mr. Basil Mercer's articles on "Passenger carriages of British Railways." Following some comments on Midland practice, he writes as follows:—

"For years I have been hoping for the general adoption of the high elliptical or circular roof coupled with straight sides, as introduced some years ago on the North Eastern Railway. There is not the slightest doubt that the saving in weight and in cost are enormous, and the effect is every bit as pleasing. Another important feature which, it appears to me, could be adopted with advantage, is the high window, right up to the eaves, as seen on some Great Northern cars. This gives a light interior, and must represent a saving in cost, since surely it is cheaper to run a window right up to the roof, than to interpose a wooden panel. That it is *practicable* is evident from the above-mentioned vehicles, which, however, have the costly and unnecessary curved sides. Prussian State Railway cars have all clerestory roofs, and are tremendously heavy, *averaging* 40 tons. The heaviest 8-wheelers are 44 tons, and the heaviest 12-wheeled sleepers over 53 tons! This perhaps accounts for their fairly good riding over track that is not to be compared to the English track, but it is rather extraordinary when it is considered that locomotive axle loads are limited to about 17 tons. All German corridor stock has straight sides, and, of course, steel exterior panelling. The only point, however, in which they can afford to boast over their British contemporaries is that they *all* carry ladders and tool-chests in case of accidents. The window arrangement (one heavy metal framed window per compartment on the side away from the corridor) is gloomy and uncomfortable, and as for the floppy, dusty, dirty curtains, they are simply abominable when compared with the

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trim British 'rollers.' Side-buffers and accordians are universal here; the average weight of the best Prussian expresses is 360 tons (9 cars) to 400 tons (10 cars), exclusive of engine and tender. The speed is generally 50 miles per hour; this speed is kept pretty regularly, on account of the flat nature of the country. There are one or two trains to Hamburg and Halle which do 55 miles per hour."

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Automatic Signalling.

CERTAIN remarks in Mr. Preston's article, published in the December RAILWAY MAGAZINE, have raised again the question whether railway conditions in America have, in fact, been so largely favourable to the introduction of automatic signalling apparatus as is claimed. It is admitted that many of the reasons advanced therefor are correct, particularly in reference to the fact that as British railways were already effectively signalled, naturally there was less opportunity for introducing power and automatic apparatus. In regard to density of traffic, distances between stations, and whether automatic signalling was favoured in its earlier days primarily on single lines and sections of sparse traffic or on busy divisions, opinions differ considerably, and the following communication from Mr. W. H. Dammond, of Nottingham, may appropriately be reproduced:—

"Mr. Preston makes several statements, no doubt quite correct, concerning conditions in Great Britain, including the assertion that 'it is very rare for stations to be more than 10 miles apart, and as a rule they are very much nearer together.' He then adds, 'In America this is not the case.' I think the table given below will more or less clearly indicate the gentleman's error on this point. The cities named in the table are situated in a section of the United States that extends about twelve hundred miles east and west and about five hundred north and south. As these cities are distributed quite uniformly over the selected territory, the column giving average station intervals for the various fifty-mile routes may be taken as fairly indicating the fact that the 'British' condition, short intervals between railway stations, is quite general throughout a section of the United States much larger than the British Isles.

"It will be observed that, in the table, the greatest average spacing of stations is less than seven miles for the fifty-mile routes and less than four miles for the ten-mile lengths. It would not be at all difficult to name a hundred routes, each route fifty miles long, in this same territory and, in doing so, comply with the stipulation that every length named shall have an average interval less than seven miles between stations.

"Mr. Preston says that 'it is necessary to remember the differences between British and American railways in order to explain why automatic signals are so widely used there.' On the contrary, I wish to state that it is necessary to remember the American railway lines which have for many years been operating under British conditions in order to explain the extensive use of such signalling in America. The first twenty years, at least, of American automatic signal history was restricted to the thickly populated portion of the United States covered by the foregoing table of station intervals. The first route to be automatically signalled was equipped in 1871. This was sixteen miles of the Boston & Maine Railroad, on a portion then known as the Eastern Railroad of Massachusetts.

"It is quite true that, outside of the above defined territory, there is an exceedingly larger section of the United States in which railway traffic is not nearly so dense; but this sparsely populated section (here termed, for convenience, 'non-British') contributed absolutely nothing to the early development of automatic signalling. It is approximately correct to say that previous to 1901 all of the railways in this thinly populated section were single-track lines. Hence, all of the automatic signalling in this 'non-British' part of the United States was necessarily single-track signalling. It is, therefore, significant to note that on December 31, 1900, there was in the United States only about four hundred miles of single-track automatically signalled; while double-track automatic signalling was in use on nearly three thousand eight hundred miles of line.

"American automatic signalling first came into extended use on railroads operating under 'British' conditions. Several years later such signalling began to appear in the less densely populated part of the country; and within the last eight years it has grown rapidly in both parts. From the time that automatic signalling first came into extended use in America, it has never been employed in the 'non-British' section on anything like as great a mileage as in the section where the 'British' conditions of short station intervals and dense traffic prevail."

Beginning at	Number of stations in 10 miles.	Number of stations in 50 miles.	Average distance between stations (miles).	Railroad.
Portland, Me.	5	16	3·3	Grand Trunk.
Newark, N.J.	8	24	2·2	Lehigh Valley.
Philadelphia	8	28	1·9	Balto. & Ohio.
Washington	6	19	2·8	Balto. & Ohio.
Pittsburgh	11	21	2·5	Pennsylvania.
Buffalo	3	13	4·2	L. S. & Mich. S.
Cleveland	6	14	3·9	L. S. & Mich. S.
Detroit, Mich.	6	17	3·1	Mich. Central.
Indianapolis	4	9	6·3	"Big Four."
Milwaukee	4	10	5·6	Chi. & N. W.
Chicago	6	15	3·6	Ill. C. & M. C.
East Alton, Ill.	4	11	5·0	"Big Four."

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"A Tax on Sentiment."

UNDER this heading a Scottish newspaper expresses condemnation of the growing practice of closing large terminal and junction stations, platform tickets being issued, usually at a charge of one penny, to control non-travellers. We cannot but think, however, that the writer of the leader in question speaks more or less "with his tongue in his cheek." As he remarks: "It is quite a just and reasonable proposition that lovers should wish to take tender farewell of each other on the station platform or on the pier when a long journey by land or sea is about to part them for a long or short period." Similarly "it is equally right and proper that husbands and wives, parents and children, brothers and sisters should desire to wave 'Good-bye' to those near and dear to them as the departing train or steamer begins to disappear from view." He then expresses the opinion that the railway companies are making a big mistake in seeking to make money out of farewells at stations; to which we would raise the query whether the imposition of a charge of one penny is likely to deter the fond lover in attendance from completing his farewells at the railway carriage door, or will prevent the anxious father from seeing his boy or girl comfortably settled in a suitable compartment in the train. It may also be suggested that this objectionable practice, introduced "for sordid reasons by railway companies who now realise hundreds of pounds thereby," does not favour sentimental farewells, seeing that non-sentimental friends will naturally save their pennies, leaving more room and affording greater opportunities for those who attach special importance to the process of "seeing off." The writer to whom we are indebted for the phrase which heads this paragraph then moralises upon the indignity of having to purchase platform tickets from common penny-in-the-slot machines; the excitement due to "last-minute" passengers, or rather their friends who wish to see them safely away, when referred from the platform barriers to the ticket machines; and the commonplace conditions which the closed-platform principle is realising. In conclusion, he has a good word for the Scottish companies who are not—as yet!—so heartless and inconsiderate. "They acknowledge the indisputable claim of sentiment to recognition when passengers are setting out on long journeys, and do not exact any toll on those legitimately entitled to grasp the hands of travellers over the carriage windows when the guard has given the signal for the train to depart."

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Railway Electrification in British Colonies.

IT is generally realised that electrification offers greatest possibilities in connection with the working of heavy and "intense" suburban traffic, and one is inclined to consider that only exceptional cities, such as London, Paris, Berlin, New York, Chicago, Liverpool, Manchester, Birmingham, and Glasgow, provide such conditions. In the busier cities of several British Colonies, however, steps are being taken, or at least the projects are under consideration, in reference to the electrification of suburban lines where traffic is heavy, though it may not compare with that of cities such as those mentioned. Thus, in Sydney and Melbourne, Cape Town and Bombay the question of electrification is receiving close attention, and the future offers notable possibilities in this respect. In regard to Bombay a report has been prepared by Mr. C. H. Merz and Mr. F. F. P. Bisacre, based on local investigations, and now under consideration by the authorities immediately concerned—the boards of the Great Indian Peninsula and the Bombay, Baroda, and Central India Railway Companies and the Bombay Port Trust. The report is highly favourable to electrification, on the ground that it would be remunerative as well as extremely advantageous for the general public. The suburban traffic must inevitably continue to increase, and it is estimated that by the time the work of electrification can be completed the advance over the present figures will be 79 per cent. The speed will be 20 per cent. higher than that of steam-driven trains, and even taking into account climatic conditions and the characteristics of the local population, a 40 sec. stop at each suburban station should be sufficient. The report estimates the cost of equipping all the suburban and Port Trust lines on the overhead wire and direct current system at £780,972, while the gain by electrification is put at £70,108 per annum, equivalent to a return of 8·98 per cent. on the capital expenditure involved.

The report suggests that to begin with a 15-minute service might be adopted for short distances and a 30-minute service for longer runs. It proposes a train-unit of three coaches, to be coupled permanently and to have their own motor in one coach, so that they can be run as a small train by themselves, or during rush hours joined to one or more additional units. The engineers suggest a joint arrangement for the generation of the necessary electric current, and propose a large power station for this purpose at Thana. It is interesting to note that in several quarters, as in South Africa, the proposal has been advanced that electric traction should be adopted on the difficult main lines, particularly where water power is available, in view of the heavy expense involved by the necessity for using very powerful steam locomotives, frequently with assisting engines.

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Maintenance of Superheater Locomotives.

THIS is a very "live" subject at the present time, but records of experience, as stated by various locomotive engineers, are exceedingly contradictory. In many cases it is claimed that maintenance is virtually negligible as compared with corresponding non-superheater engines; in other instances it is admitted that while maintenance is a more serious factor, the additional working capabilities realised by superheating, and the fuel and water economies resulting therefrom, more than compensate therefor; while a few engineers argue that the practice is hardly worth adopting in view of the difficulties which follow. The third aspect may be dismissed, seeing that it is so strongly discounted by the fact that superheating is adopted so widely and universally; but it is difficult to understand the other conditions set forth. The secret must lie in the treatment of the engines, features of design, whether the superheater locomotives are systematically worked on a harder basis than their non-superheater correspondents, and the carefulness with which they are looked after.

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Undoubtedly more is expected of the superheater engines than of their companions, and there is a tendency to treat them harder. On the other hand where a number of such engines are in service, and drivers and shed staff have been able to learn their peculiarities and how to treat and look after them, there should be no difficulties, especially when the superior working capabilities and economies realised justify a degree of special attention. This appears to be the most satisfactory view of the situation, and where it does not meet the case the solution of difficulties which occur must be sought in other directions, such as features of design, workmanship and the like. That big economics and superior capabilities result is unquestioned; difference of opinion applies only to the cost at which they are realised; but notwithstanding the somewhat conflicting statements which are made in this connection, it appears quite certain that the superheater locomotive is worth having, even if its over-all value does not altogether come up to the original estimates.

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Should Locomotive Engineers Start Afresh?

THE proposal made some time ago at the Institution of Mechanical Engineers that good service to locomotive engineering would be rendered by the constitution of a joint fund for building one or more experimental locomotives incorporating the ingenuity and skill of leading locomotive engineers in council, was revived again at the Institution of Civil Engineers in the discussion of Mr. H. Fowler's paper on "Superheating in Locomotives," but was further amplified by the suggestion that the general features of practice might be departed from and an attempt made to start afresh, instead of proceeding on conventional lines. Speaking generally, the proposal did not receive much favour in view of the fact that it was coupled in some degree with the suggestion that its carrying out might involve the use of water-tube boilers, steam turbines or high speed engines, compounding, superheating, feed water heating, condensing and mechanical transmission, thus setting forth the usual alternatives advanced by the stationary or marine engineer when he ventures to advise his locomotive brethren. Moreover, attempts to improve the efficiency of the steam locomotive have usually incorporated some of these features, but in most cases without notable results where characteristic methods of design have been seriously departed from. But, as one well-known locomotive engineer remarked to the writer, there may be something in the proposal, and it may be suggested that if a fresh start were really made, instead of an adaptation of old methods on new lines with fresh features, results might prove satisfactory, more especially in view of the fact that with electric and internal combustion traction there is a tendency to adapt traffic to the locomotives, instead of locomotives to the traffic, as occurs with the steam engine, and the same may apply in the case of an entirely new departure in steam locomotive design. The difficulty is, however, that locomotives have to be built to work traffic, not to further the cause of locomotive engineering, and for this reason the proposal for constituting a joint fund for the latter purpose is apposite in this connection. On its own merits the proposal that locomotive engineers should endeavour to initiate a new line of practice appears to conflict with the claim that locomotive engineering differs from all other branches of engineering and that present methods represent the "survival of the fittest." On analysis, however, it may be admitted that the suggestion advanced offers interesting possibilities, though it can hardly be contended that its probabilities are very favourable in view of what has already been done.

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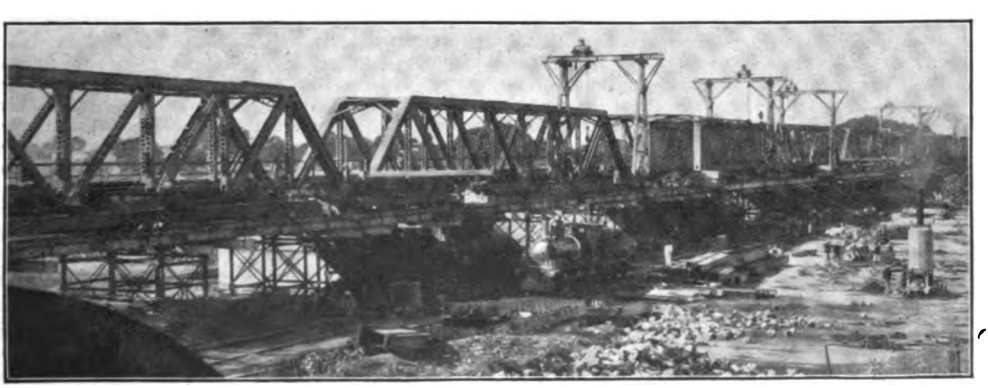
Death of Sir Frank Ree, General Manager, London & North Western Railway.

WE much regret to record the unexpected death of Sir Frank Ree, on the verge of his retirement from the position of General Manager, London & North Western Railway. He was born in Fulham, S.W., when the close of the year of the first International Exhibition was well in sight. His early education was obtained at the Royal College, Epsom, leaving which he widened his educational outlook by studying in France, Germany and Switzerland. His business training commenced with Messrs. Lebeau & Company, Continental carriers, to the



KIUL BRIDGE, EAST INDIAN RAILWAY, UNDER CONSTRUCTION.

In the RAILWAY MAGAZINE, May, 1913, an article describing the construction of this bridge appeared on page 415.

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London and North Western Railway, and positions with that firm in various places in France, Switzerland and Germany added to his knowledge of the carrying trade. To obtain experience of the railway branch of the business, he joined the London and North Western Railway on October 1st, 1873, and was attached to the Broad Street (City) Goods Depôt, whence, after a short stay, he was promoted to Euston. Here his marked abilities soon attracted notice, and, in 1878, he became Assistant to Mr. David Stevenson, then London Traffic Superintendent of the London and North Western Railway. In April, 1885, he was appointed Assistant to Mr. David Taylor, the London and North Western Railway District Manager at Liverpool, whilst in February, 1889, he succeeded that gentleman as Manager for the Liverpool and Birkenhead District. In June, 1893, Sir Frank Ree, went back to Euston as Chief Goods Manager, succeeding Sir Frederick (at that time Mr.) Harrison, who became General Manager on the death of Sir George Findlay. In 1900, he acted as Chairman of the Goods Manager's Conference of the Railway Clearing House. Having occupied the position of Chief Goods Manager for over fifteen years, Sir Frank Ree succeeded Sir Frederick Harrison as General Manager on February 1st, 1909, and on January 1st, 1913, was honoured by His Majesty the King, a knighthood being then conferred upon him.

His wide experience of railway matters and business affairs generally was not solely derived from the extensive and varied knowledge gained by thirty-five years' arduous work on the London and North Western Railway, for during recent years he made several visits to America, as well as frequent journeys to the Continent, to study railway methods. Mr. Guy Calthrop, already appointed to succeed the late General Manager, will shortly be taking up the reins of office at Euston; but in many ways the careful guidance and skilful control associated with Sir Frank Ree, will be greatly missed for some time to come.

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Pullman Cars on the Caledonian Railway.

EXCEPT for the use of Pullman sleeping cars in earlier years on through Anglo-Scottish trains, Pullman vehicles have been unknown north of the border; but the directors of the Caledonian Railway now announce that they propose introducing such cars on trains between Glasgow and Aberdeen, Edinburgh and Oban, as well as on certain long-distance residential routes. The vehicles are being constructed in Sheffield, and are intended to incorporate the best Pullman practice in respect of excellence of equipment and design. It is understood that on the Oban route, Pullman observation cars will be used; while on all services provisions will be made for the supply of light refreshments, as well as more elaborate meals, the cars to some extent completing the arrangements at present in force in regard to restaurant accommodation.

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German Engines for the South Eastern and Chatham Railway.

REFERENCE is made on the opposite page to statements by Mr. Cosmo Bonsor, chairman of the South Eastern Railway Company, indicating that a strong forward policy is contemplated, the line having been strengthened and other improvements made in preparation therefor. The situation which has existed so far, has been met to a large extent by patching up the older locomotives, as there was no justification for ordering new ones conforming to existing limitations while several smaller Great Northern engines have been borrowed for the time being; but now that they are ready to proceed, the directors have ordered the first instalment of larger engines, from the well-known firm of A. Borsig, of Tegel-bei-Berlin, the home firms of locomotive builders being unable to guarantee delivering at the early dates desired, owing to pressure of other work. It is understood that in succeeding orders, builders in this country would be concerned. The new engines under construction in Germany are strictly to British specifications and drawings, and will be inspected by a well-known firm of consulting engineers used to such work for Indian and South American Railways. Although a fair number of foreign-built locomotives have been used in this country, as a rule to meet a sudden demand, they have nearly all been constructed more or less to the builder's drawings; whereas that is not the case in the present instance. It is stated that the engines are required for this summer's traffic, and interesting developments may be looked for.

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New Railway Officers.

MR. G. H. PEARSON, of the Great Western Railway Carriage Department at Swindon, has been appointed assistant locomotive Superintendent, South Eastern and Chatham Railway. To succeed Mr. W. Pickersgill, who is shortly taking office as Locomotive Carriage and Wagon Superintendent of the Caledonian Railway, on the retirement of Mr. J. F. McIntosh, the directors of the Great North of Scotland Railway have appointed Mr. Thomas E. Hedwood, as their Locomotive Carriage and Wagon Superintendent. Mr. Hedwood is at present chief assistant superintendent of the locomotive department of the Taff Vale Railway. He was formerly assistant locomotive superintendent of the Burma Railways.

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PRESIDING at a joint meeting of the proprietors of the South Eastern and London, Chatham and Dover Railways, Mr. H. Cosmo Bonsor said that owing to the new system of keeping accounts it was impossible to compare the year 1913 with 1912. Generally, however, they could report increased traffic receipts of £209,000. Of this £165,000 was passenger traffic, £30,000 goods traffic, and steamboat £14,000. Unfortunately they had to report a falling-off in suburban traffic, though it was to be noted that under this head they had carried 600,000 more workmen in 1913 than in 1912. Altogether fourteen million workmen were carried yearly under the Cheap Trains Act, this traffic being sustained virtually at a loss to the company. He was glad to report that the company had carried during the year 23,000 tons of Kent coal. As yet the coal which was being worked from existing seams was not suitable for locomotives. For gas, however, it was as good coal as any in the country. When they reached the deeper seams he hoped that locomotive coal would be available. The maintenance of road accounts showed an increase, and the same was true of the repair and renewals of locomotive stock. This was owing to substantial improvements that were being made. Gradually during the past few years the main line had been strengthened for the taking of heavier locomotives. The board had pursued a policy of patching up light engines and keeping them running while they prepared for the great change in the introduction of the heavy locomotives which were at present in preparation. Referring to the accident which took place at Waterloo Junction, Mr. Bonsor said that it arose from an unaccountable mistake. Their system of signalling was completely up-to-date, and their code of rules strictly adhered to, was one of the most perfect of any system in the world. As regards the Channel Tunnel, the management considered national security as all-important. Since Sir Henry Campbell-Bannerman "killed" the scheme some years ago by a statement in Parliament, they had done nothing more to promote it. They had, however, carefully watched the great change in public opinion in regard to the matter, and they were satisfied the Channel Tunnel would not only be an engineering success, but a commercial success as well.

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AT the recent annual meeting of the East London Railway, Lord Claud Hamilton said the period under review covered only seven months of electric working. They had had, therefore, too short a period to afford any real indication of what electricity was going to do for the company. He was bound to confess that it had not come up to their expectations. At the same time he was not disheartened, because he did not think they could arrive at any sound conclusion on the subject until the experiment had extended over a longer period. It was hoped that the special advantages offered by electric working would bring back a large number of passengers which they had lost under the old system. Unfortunately, since they decided on electrification, a new factor, and to his mind a very disagreeable one, had arisen—that of motor-omnibuses. These omnibuses paid no rates, no Government duty, and were under no control or supervision whatever, whereas a railway had to pay Government duty and rates, and was under very strict supervision by the Board of Trade. The British public liked novelty, and there was no doubt that for the moment they had been captured by the motor-omnibuses. The total number of passengers carried from November 1, 1912, to October 31 last, the period under review, was 4,869,390, as compared with 4,261,336 in the preceding year. The increase in passengers for the seven months of electric working within that period was 673,200. He had to admit that these figures were wholly inadequate when compared with the returns during some of the years in the decade of 1900, at a time when their line was under steam. In the first year of that decade, 1900, the passengers numbered 7,072,492, and the total receipts for that year were £54,446, while three years later, in 1903, the corresponding figures were 6,826,511 and £56,100, the latter being the highest they had ever had, at all events in the later history of the company. Their £40,000 of receipts from all sources in the past year compared very badly with those figures.

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GOOD progress is recorded by the Hull and Barnsley Railway, the dividend declared on the Consolidated Stock for 1913 being an increase upon that paid the year before, though it is otherwise difficult to compare the results in detail owing to the new form in which the accounts are presented. It has not been found possible to complete and open the Hull Joint Dock during the past year, the delay being chiefly due to the difficulty in obtaining deliveries of equipment owing to the abnormal condition of business in the iron trades. Water has been let into the Dock, and pressure is being put upon the contractors for the machinery and plant required with a view to the Dock being opened for traffic about the middle of the present year. The construction of the Joint Railway of the Hull and Barnsley and Great Central Companies, from Gowdall to Braithwell, is making steady progress, and it is expected that it will be completed before the end of this year. The Jetty at Salt End, for the accommodation of oil business, which is being constructed in

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conjunction with the North Eastern Railway, is approaching completion, and the dredging of the channel is being proceeded with. A Bill has been deposited in Parliament for powers to enable additional land to be acquired to admit of extension of siding accommodation at Springhead and Sandholme.

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TRAFFIC receipts per mile of line, exclusive of worked lines, have yielded £1,191 during 1913, in the case of the Highland Railway. Receipts per train mile for passenger train traffic have been 50·71d., and for goods train traffic 46·99d., the percentages of these traffics to the total traffic receipts being respectively 62·51 and 37·49. Proportion of working expenses to traffic receipts is 57·73 per cent. Provision has been made out of the revenue of the year to the extent of £14,034 for new engines, and £5,100 for new corridor carriage stock. The Directors deeply regret that they have to report the death during the past year of two of their colleagues, the late Duke of Sutherland and the late Sir Wm. Ogilvy Dalgleish, Bart. They recommend that the Duke of Sutherland be elected a Director in place of the late Duke of Sutherland, and that Mr. W. H. Cox, Snaigow, be elected a director in place of the late Sir Wm. Ogilvy Dalgleish, Bart. Mr. William Roberts retired from the position of Engineer-in-Chief on 31st December last, and Mr. A. Newlands has been appointed to succeed him. The directors record their appreciation of the service rendered by Mr. Roberts during his long connection with the Company. The strengthening of the main girders, 230 feet span, of Oykel Viaduct, Invershin, was completed in the early part of the year. Train tablet block apparatus, adapted for switching-out of Tomatin and Moy stations for night working, was completed in time for the early summer traffic. A siding for timber traffic at Fodderty, on the Strathpeffer branch, was opened in February last. A new siding and improvements of loading bank have been completed at Brodie for the timber traffic there. Platforms are being lengthened at Elgin, Rogart, Golspie and Brora. Additional staff refreshment rooms have been provided at Kingussie. A block of four houses for workmen is in course of erection at Kingussie, and will be completed early in the spring. Widened lines between Clachnaharry and Bunchrew were opened for traffic in June, 1913, and the continuation of this work northwards to Clunes is being pushed on with.

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THE Directors of the North Staffordshire Railway report that the total traffic carried upon the railway for the year ended 31st December, 1913, shews, as compared with 1912, an increase of £59,500. The heavy increase of expenditure is caused by the large advance in wages, cost of the National Insurance Act, and the enhanced prices of coal, iron, timber, rails and other materials. The Directors recommend a Dividend for the half-year ended 31st December, 1913, at the rate of 6% per annum upon the Consolidated Ordinary Stock, making, with the Interim Dividend paid in August last, a total Dividend for the year of 5%, carrying forward the sum of £10,841 16s. 5d. The total engine mileage for the year is 4,562,290. In pursuance of the Railway Companies (Accounts and Returns) Act, 1911, the ordinary general meetings of the Company will be held annually in future, in the month of February, alternately in London and Stoke-on-Trent, but it is the intention of the Directors to declare Interim Dividends in July or August. The Trentham, Newcastle and Silverdale Light Railway Order, 1912, has not yet received the approval of the Board of Trade.

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THE Annual Report issued by the Midland Great Western Railway Company refers to the Parliamentary Bill lodged by the promoters of the Galway (Barna) Railways and Harbour Project. Whilst the directors recommend the shareholders to approve of this Bill, so that it may be proceeded with this session, they desire to refer to the resolution passed by a large majority of the shareholders at an extraordinary meeting, held on 17th November, 1913, stating: "That the Directors of the Midland Great Western Railway of Ireland Company be and they are hereby authorised to subscribe a sum not exceeding £3,000 towards the promotion of a Bill in Parliament with the object of making Galway a Trans-Atlantic Port, provided they are first satisfied that there is a reasonable probability of the necessary capital being found to enable the scheme to be successfully carried out, and that the interests of the Midland Great Western Railway of Ireland Company are properly safeguarded." The directors regret, however, that the conditions stated in the resolution have not yet been complied with. They also point out that the passing into law of the Bill would be no guarantee that the scheme can be financed, or the undertaking carried out. Land has been acquired at Rosses Point, near Sligo, adjacent to the golf links, for the purpose of erecting a suitable hotel. The new station at Islandeady, which is being constructed midway between Castlebar and Westport, is nearing completion, and will be open for traffic shortly. An interesting statement is also made that the withdrawal of second class passenger train accommodation is contemplated at an early date. This will necessitate a re-arrangement of fares, of which due notice will be given to the public.

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STATISTICAL returns just issued by the Great Eastern Railway show that during 1913 the company carried 97,172,646 passengers, exclusive of season ticket holders, at an average fare of 5·76d., amounting in all to £2,333,014. Season ticket holders numbered 61,924 and the revenue collected from them was £572,488. Merchandise and minerals carried amounted to 13,232,907 tons, for which the receipts totalled £2,611,092. To earn £92,081, live stock carried numbered 1,790,329. From the same source the following facts are taken:—Running lines reduced to single track, 1,809 miles; sidings, 618 miles; total, 2,427 miles; Great Eastern share of joint-owned lines, 163 miles; total of lines leased and worked, 2,616 miles. The company has 725 tender engines, and 549 tank engines, 4,096 passenger vehicles, and 1,721 other passenger train vehicles. Total number of goods and mineral wagons owned is 27,092. Four hotels are worked by the company, namely, Liverpool Street, Parkeston Quay, Harwich and Hunstanton. Steamboats include 11 vessels of over 250 tons, the aggregate tonnage being 7,567. Train mileage amounted to 23,374,969 and the total engine miles to 30,582,919.

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Although a continuous development of the general passenger traffic has been maintained, there has been a considerable diminution in the suburban traffic, more especially in the number of passengers travelling between intermediate stations. Autumn fishing at Yarmouth and Lowestoft was the most successful on record, and resulted in an increased rail traffic. Heavy increase in expenditure was caused by the large advance in wages, the cost of the National Insurance Act, and the enhanced price of coal, iron, timber and other materials.

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RECKONED as single track, the Great Northern Railway now has 1,509 miles of lines and 750 miles of sidings. The Great Northern's share of joint-owned lines amount to 2,825 miles. The company has 876 tender engines and 469 tank engines; 2,837 passenger vehicles and 850 other coaching vehicles, making a total of 3,687. The total number of goods and mineral wagons is 40,254. Six hotels are owned, viz., King's Cross, Peterborough, Bradford, Leeds, Lincoln and St. Neots, but the two latter are not worked by the company. Train mileage for 1913 amounted to 22,339,688, and the total engine miles to 31,169,393. The recently issued annual report states:—"The disturbing factor in any attempt to compare the accounts of the receipts and expenditure for the working of the railway is the elimination from the receipts of the earnings by Great Northern trains running over other companies' lines. The proprietors are asked to sanction expenditure of £50,000 on sundry new works, etc."

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GROSS receipts of the London Electric Railway during 1913 amounted to £715,319, expenditure to £332,856, and miscellaneous receipts (net) from rents, interest, etc., to £59,001, giving a total net income of £441,464. The extension from Edgware Road to Paddington, opened on December 1st, 1913, has already been responsible for considerable traffic development. Good progress has been made with the construction of the extension from Charing Cross to the Embankment, and it is hoped this will be opened for public traffic at an early date. The work on the Queen's Park Extension and Oxford Circus Escalators is also well advanced. The Rt. Hon. Lord George Hamilton, the late Chairman, has retired from the Board. The directors have elected the Rt. Hon. Lord Farrer as Chairman in his place, and the Rt. Hon. Viscount Knollys has been elected to fill the vacancy on the Board created by Lord George Hamilton's resignation. Rolling stock on December 31st, 1913, consisted of 168 motor cars, 138 control trailer cars and 168 ordinary trailer cars, with 19 service vehicles. Train mileage during the year amounted to 5,445,183 miles, and 74,565,591 ordinary passengers and 21,136,580 workmen were conveyed. There were 7,310 season ticket holders.

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THE Directors of the Metropolitan District Railway Company report that the gross receipts of the railway during 1913 amounted to £789,662, the expenditure to £383,132, and miscellaneous receipts (net) from rents, interest, etc., to £116,542, leaving a total net income of £523,072. Electrification of the East London Railway and the work of constructing flying junctions at Earls Court have been completed. The works in progress at Charing Cross Station, which are being carried out in conjunction with the London Electric Railway Company, will be shortly completed. A satisfactory means of interchange will be established at this point between the Metropolitan District Railway and the Bakerloo and Hampstead Lines of the London Electric Railway Company, and the station thus reconstructed must become a large exchange centre for passenger traffic between the three above-mentioned railways. During 1914 capital expenditure to the extent of £114,550 is anticipated, and this includes the electrification of the line between West Kensington East Junction and Earls Court Junction, the enlargement of Aldgate East station, and £68,500 on more rolling stock. Rolling stock is reported as consisting of 2 steam locomotives, 6 electric locomotives, 206 motor cars, 218 trailer cars, and 49 service vehicles. During 1913 ordinary traffic accounted for 56,709,913 third class passengers, 3,314 second class, and 2,325,147 first class, with 15,657,958 workmen, without counting 1,801 first class season tickets, 4 second class, and 21,820 third class. 313,502 tons of merchandise, coal and other minerals were carried during the year, with 4,174 head of live stock.

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A GOOD report is presented by the Central London Railway Company, and the dividends reached in 1912 are maintained for 1913. The Liverpool Street extension has required an additional £38,147 for completion, and automatic signalling accounts for £5,513, while £797 are attributed to new tunnel ventilation, £827 to equipment of line and station, and £53 to the extra cost of replacing wooden platforms with stone. It is estimated that during 1914 about £10,000 will have to be spent on the Liverpool Street extension, £7,563 on automatic signalling and £11,833 on miscellaneous new works and additions, while the Ealing Extension and new rolling stock will call for the expenditure of some £60,000 each. Present rolling stock consists of 2 steam locomotives, 2 electric locomotives, 64 motor cars, 38 control trailer cars and 133 trailer cars, with 19 service vehicles. Ordinary traffic during the year accounted for 30,042,301 passengers, 4,396,640 workmen, and an estimated number of 3,066,483 season ticket journeys.

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ON Saturday, 31st January, some 200 members and friends of the Permanent Way Institution assembled at Anderton's Hotel, Fleet Street, London, E.C., the occasion being the annual dinner, following the annual general meeting (held at the Institution of Civil Engineers). Mr. W. Cleaver, M.Inst.C.E. (chief engineer, Port Talbot Railway), President for 1914, occupied the chair, and was supported by Mr. G. T. Sibbering, M.Inst.C.E. (chief engineer, Taff Vale Railway), President for 1913; and by no fewer than seven other past Presidents—Mr. J. B. Ball (chief engineer, G.C.R.), Mr. W. Willox (chief engineer, Metropolitan Railway), Mr. S. L. Murgatroyd (maintenance engineer, G.C.R.), Major G. Hurlstone Hardy, Mr. C. L. Morgan (chief engineer, L.B. & S.C.R.), Mr. J. Wilson (late chief engineer, G.E.R.), and Mr. Meredith (the veteran first President of the Institution). Letters of regret were received from several other past Presidents and members,

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including Mr. R. L. Robertson (chief engineer, L.T. & S. section, M.R.), owing to family bereavement; and Messrs. Jacomb-Hood and Szlumper (L. & S.W.R.) Following the dinner, an interesting musical programme was rendered, the artistes being Messrs. Hal Burte, Ernest Downing, R. A. George, Leo W. Savage, and A. Vellere, with impromptu selections by Mr. McLewin (hon. secretary of the Institution), and Mr. Benedict (one of the oldest and best-known members). The usual loyal toasts were proposed by the Chairman. In proposing the toast of "The Permanent Way Institution." Mr. Willox referred to the fact that many original members, dating from 1884, still remained, including Mr. Pugh (hon. librarian) and Mr. Meredith (the first President). In 1908, when he was President, he saw much of the working of the Institution. There were then about 800 members; the total is now over 1,400, and the Institution includes members in all parts of the world, including China. Mr. Sibbering gave the health of "The President," remarking that Mr. Cleaver had been a very active member for eleven years, had taken great interest in the South Wales section, and as secretary and organiser of visits and meetings applying thereto, naturally considered it the most important section of all! He made some highly appreciative remarks in reference to the South Wales meeting last summer, and anticipated a good time during the French visit arranged for the coming summer, with Mr. Cleaver in charge. Replying, Mr. Cleaver spoke of the progress of the Institution since his association therewith. He appealed for good support next summer, so as to show their French friends and prospective friends that the Institution is a really influential one. Proposing the health of "The Past President," Mr. Ball referred to the fact that they had two Welsh engineers in succession as Presidents—men who came from Wales were men of ideas, they could initiate things and make matters lively for other people, and yet be successful! Mr. Murgatroyd offered the health of "The Executive Officers." He would hardly say the Institution had had its ups and downs, rather he would say, its "ups" and "stagnations"; but the executive had stuck well to their work, while it is well to remember that a membership of 1,400 or so involves a great deal of clerical labour, apart from other considerations. After expressing appreciation of Mr. McLewin's long executive association with the Institution, and remarking that most of the officers were tried men, he called for special acknowledgment of the services of the corresponding secretaries, the success of the sections depending so largely upon the way in which they did their work. Mr. A. G. Pugh replied, introducing a "bit of Nottingham" as a contrast to the Welsh influence. On behalf of his executive colleagues he thanked Mr. Murgatroyd and other speakers for their kind remarks, appreciating particularly the references to the corresponding secretaries, who were so often overlooked. He asked whether many Institutions of thirty years' standing could record the presence of nine Presidents, apologies from four others, while of the remainder death has removed six; especially when it is remembered that several gentlemen have served for two years. Mr. J. S. F. Higginson, in a witty speech, proposed "The Health of the Visitors." Mr. R. G. Davidson replied to this, and the final toast—"Absent Friends"—was very kindly offered by Major G. Hurlstone Hardy.

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On Monday, February 16th, a demonstration was given at the Science Museum, South Kensington, of the Schilowsky gyroscopic monorail system. The inventor, Mons. Pierre Schilowsky, explained the principles of his invention, which differs from the Brennan arrangement in that a special system of suspending the gyroscope is employed, while many of the special complications hitherto necessary are now avoided. The model equipment has been presented to the Museum, but the inventor is equipping an experimental line on an interesting scale. Main features of the Schilowsky system are: The controlling mechanism is absolutely and immediately automatic in action; for this reason, a very low speed of rotation of the gyroscope is permissible and adequate; and the weight of the gyro is trifling compared with that of the vehicles which it equilibrates; by means of the Schilowsky couplings, one or more "gyro vehicles" may be distributed throughout the length of a train, each such vehicle being in conjoint, but virtually independent control of from one to five coaches or wagons. Hence a train may be made up with an adaptability to traffic requirements comparable with that of a double-track line. Other features which may be noted are: the absence of lateral oscillation, or "shock" (as between the wheels and the rail), allows a much lighter construction of rolling stock for a given load; gyroscopic control permits the employment of horizontal rail curves of extremely short radius. On such curves the train may lie over to an angle of 45 degrees without observance of the inclination by passengers, or any disturbance of goods; a modified form of "gripping wheel" (*i.e.*, the alteration, in appropriate situations, of the cross-section of rail so that friction in the ∧ or ∩ groove of the driving wheel tyre is temporarily increased) makes the use of gradients of 1 : 8 (under which condition gyroscopic control is still complete) perfectly feasible, with obviously decided gain in economical way-construction. This gripping device, which is also of service at normal starting points, is altogether inapplicable to double-track lines, owing to the absence of strict parallelism throughout, and to the alteration in wheel-gauge due to varying temperatures.

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At a meeting of the Midland Railway (Derby) Literary and Debating Society, Mr. E. Falconer, of the chief goods manager's staff, read a paper on "Railway Management: Central or Divisional?" Mr. Falconer described in detail, illustrating the systems by means of charts, the managerial organisations on the American, Prussian, French, and English railways, and he quoted extracts from a speech of a Minister of Public Works to the Prussian Parliament in 1893, in which, after a complete investigation had been made into the working of the divisional offices of the Prussian State Railways, the divisional system was thoroughly condemned. After discussing the argument that is used by many railwaymen that the idea of district officers being necessary to exercise closer supervision over detail rests on a fallacy, the speaker

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MR. F. L. STEEL.
Deputy-Chairman: Great Northern Railway.

went on to explain the necessity there was for harmony and uniformity, both as regards the staff and the public in the working of a railway, and that this was best obtained under a centralised system. He also spoke of the danger there was of unnecessary duplication of work under a divisional system.

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FOUNDED in 1854, the Great Northern Railway Literary Society celebrated its jubilee in 1904, and this year—1914—is therefore the diamond jubilee of the society, which is open to members of the professional and clerical staffs. The advantages it offers are:—A library of about 5,000 volumes; the leading newspapers, periodicals and magazines; a large billiard room with three full-sized tables; a reading room; a chess and draughts room. The "great" function of the society's year is the annual smoking concert at the Queen's Hall, Langham Place, N., and the one held on January 29th was the 28th, the first being held in 1887 at the old Freemasons' Tavern. The Society afterwards moved to larger premises at the King's Hall, Holborn Restaurant, and this not proving big enough, in 1898 went to the Queen's Hall and for the first time ladies were invited to attend. The concerts have been very popular, and particularly so since they have been held at the Queen's Hall, as there it has been possible to provide for ladies as well as gentlemen. Arranged as a Great Northern social event, without any attempt to make large pecuniary profits from the concert, when there is a profit it is devoted to the Literary Society. Mr. F. L. Steel (Deputy-Chairman, Great Northern Railway) performed the duties of chairman at the recent concert in genial style and spoke of the good work performed by the Society. Mr. J. B. Costello, the hon. secretary of the Literary Society, has just retired from the service of the Great Northern Railway after 43 years in the engineer's department, and the opportunity is here taken to reproduce the portrait of this popular gentleman.

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AFTER a service of thirty-seven years with the North Eastern Railway, the Passenger Manager, Mr. Philip Burtt, is retiring. Mr. Burtt, who was, in May, 1905, chosen by the directors to be the first occupant of a new and important position—that of Deputy-General Manager—was born in 1862, and upon leaving school in 1877 he entered the railway service as Junior Clerk under the General Goods Manager. Here Mr. Burtt obtained a thorough insight into the working and policy of the department, and in 1882 he was transferred to the General Manager's office. Mr. Burtt had not long been in this department before

Photo [*U.S.A. Studios.*
MR. J. B. COSTELLO.
Hon. Secretary, Great Northern Railway Literary Society.

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his abilities attracted the notice of the then General Manager, and in 1891, when Sir George (then Mr.) Gibb was chosen as General Manager, Mr. Burtt became one of the senior clerks in his office, and subsequently Chief Clerks. This post he occupied until, in August, 1897, he was appointed Superintendent of the Line. In 1900, the directors made a complete re-arrangement of the Departments, and in December appointed Mr. Burtt to the newly created post of General Traffic Manager. In the following year he was sent with the General Manager and other officers of the North Eastern Railway to make inspection of American Railroads, and inquire into American Railway systems. In consequence of continued ill-health, Mr. E. L. Davis, Chief Passenger Agent, was compelled to retire early in 1911 (he died later in the year), and his department was then also placed under the charge of Mr. Burtt, in the capacity of Passenger Manager.

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In connection with the great centenary celebrations of 1914, Mr. A. E. Diggins, traffic manager, Stratford-upon-Avon and Midland Junction Railway has issued a very attractive folder primarily for the use of American visitors to Stratford-on-Avon. Bearing the familiar star-spangled banner of the United States of America and George Washington's portrait, the folder reminds all and sundry that the "S.M.J." Railway connects Harvard House (home of the founder of the famous American University) and Shakespeare's birthplace (Stratford-on-Avon) with Washington's home at Sulgrave (Morton-Pinkney station). Illustrated with reproductions of photographic views, the folder gives a succinct history of Washington's ancestral home; the origin of the stars and stripes; and an account of Harvard's House, supplemented with useful information concerning railway routes to Stratford-on-Avon. RAILWAY MAGAZINE readers can obtain full particulars of train services on application by postcard to Mr. Diggins and American readers who intend visiting Great Britain during the coming tourist season are cordially invited to send for the folder and other literature descriptive of the "Shakespeare Route."

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On February 1st, Mr. Gilbert S. Szlumper took up his position at Waterloo as assistant to the General Manager, London and South Western Railway. Son of Mr. A. W. Szlumper, the company's London district engineer, he was educated at King's College School and underwent his technical education at King's College (engineering faculty). He is, by examination, an associate member of the Institution of Civil Engineers. Mr. Szlumper joined the London and South Western Railway's service about twelve years ago as a cadet, and was articled to the chief engineer, Mr. Jacomb-Hood, for the first three years, portions of this period being spent in the various divisions of the engineers' department; he subsequently had part charge of the construction of the Bentley and Bordon Light Railway—a work which was carried out successfully without the aid of a contractor. Shortly after the completion of this work he was appointed an assistant to the district engineer at Exeter, and whilst engaged in that district carried out the widening and reconstruction of Yeovil Junction station. Returning to the chief office on its completion, he was engaged for some time on track-alignment improvement, and in 1910 was appointed chief assistant to the Central district engineer at Eastleigh, where the work he supervised was extensive and varied. He remained at Eastleigh until May, 1913, when he was appointed to the important charge of the section of the electrification to be carried out under Mr. Jacomb-Hood, including also the construction of the new "flyover line" at Hampton Court Junction to enable branch trains to diverge without crossing the main lines.

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The latest series of Underground posters, the striking lithographs of London which are attracting so much attention at the stations where they are displayed, are the work of the Senefelder Club, a fraternity of artists founded in 1909, and including Messrs. Frank Brangwyn, Joseph Pennell, Spenser Pryse, Ernest Jackson, and A. S. Hartrick among its members. Mr. Pennell is president and Mr. Jackson secretary, and exhibitions of the works of the members are held annually in London. The Club takes its name from Alois Senefelder, of Munich, author, artist, and printer, who introduced lithography about 1796. There are eight posters in the series, which have been produced under the direction of Mr. Ernest Jackson. The drawings are in each case accompanied by an appropriate selection from a well-known writer. Mr. Frank Brangwyn has depicted a corner of the Port of London, a characteristic delineation of wharves and men and ships, with an apt quotation from Richard Jefferies' "Nature in London." Mr. Kerr-Lawson shows Charing Cross, with Le Sueur's statue of Charles I. dark in the foreground and St. Martin's portico and steeple rising up white behind, with a paragraph from "The Town" of Leigh Hunt. Chiswick Mall and its old-world riverside houses pregnant with recollections of Hogarth, Pope, Walpole, and Thackeray, is the work of Mr. Ernest Jackson; and Charing Cross Underground station—the meeting of highways old and new—is by Mr. Joseph Pennell, with a quotation from Charlotte Bronte. Other aspects of London shown are the theatre, an impression by Mr. Anthony R. Barker, with letterpress from Ruskin's "Præterita," and a study of the spectators at a football match, by Mr. Spencer Pryse, with the old Spanish proverb, "He knows nothing who does not mix with the crowd." "The Dance," a simple and striking effect, is by Mr. A. S. Hartrick; and the last of the series, a call to the country-side for those who can free themselves from the glamour of the town, is by Mr. Harry Becker, with lines from Stevenson's "Underwoods." Copies of the posters have been sent to the British and the South Kensington Museums.

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At the annual meeting of the Sheffield Chamber of Commerce, the president of the Chamber, Mr. T. W. Ward, who is also master-cutler, said that several railways were manufacturing their own railway tyres and axles. It was only fair to assume that the railways were no more successful in manufacturing these tyres and axles than tyre and axle manufacturers would be in conducting a railway. It followed that railways could not make axles and tyres as cheap as

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they could buy them. The loss which was incurred by manufacturing themselves could only be redeemed by revenue from the traffic which they carried. The London and North Western Railway were manufacturing their own steel rails. The London and North Western, the Midland, and the Lancashire and Yorkshire were now in one combine. How long would it be before the contention was set up that their combination enabled them to supply rails to the Midland and Lancashire and Yorkshire companies? If all railways were to manufacture their own locomotives they might have 40 different plants, but they would not be available in times of bad trade to execute export orders. In this way the country was handicapped in allowing railways to manufacture their own requirements, because these plants must stand idle during the time the companies were not extending their rolling-stock or equipment.

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THE third annual dinner of the Institution of Locomotive Engineers was held on Saturday, February 7th, at the Royal Adelaide Gallery, Gatti's Restaurant, King William Street, Strand, W.C., the President, Mr. A. J. Hill, Locomotive Superintendent, Great Eastern Railway, in the chair. There was a large and influential gathering, including many ladies. Among the speakers proposing or responding to the toasts were Mr. C. A. Suffield (Chairman of the Institution), Mr. W. A. Lelean (Vice-Chairman), Mr. F. V. Russell (Outdoor Assistant Locomotive Superintendent, Great Eastern Railway), Mr. A. R. Bennett and Mr. J. A. Kay (*Railway Gazette*). During the proceedings Mr. H. Fowler, Chief Mechanical Engineer, Midland Railway, the retiring President, presented the Literary Awards for 1913, the first to Mr. W. J. Bennett for his paper on "Locomotive Boiler Examination, Defects and Repairs," and the second to Mr. J. F. Gairns for a paper on "Some Debatable Factors in Locomotive Design and Practice."

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A CONTRACT has been placed by the Great Western Railway with the Avon India Rubber Company, Ltd., for the tyring of the railway's motor omnibuses with Avon band tyres during the ensuing twelve months. The Great Western has also given the same firm a large contract for the supply of mechanical rubber goods for railway purposes during the same period. These contracts mark another step in the continued success of Avon products, and so far as band tyres are concerned, it is significant that the firm are securing a large proportion of business for public service vehicles, where it is evident that Avon tyres satisfy such varied demands as a high degree of riding comfort for passengers, the absolute minimum of upkeep and running costs for ratepayer-owners, least damage to public roads and dependable service at all times and under all conditions. In this connection it may be noted that Avon bound tyres are fitted (principally of the new "B" type) to the passenger chars-a-banc of the Grimsby Provincial Tramways Co., Ltd., to the electric repair towers of the Stretford U.D.C., and to the motor fire engines of the Derby Corporation and Surbiton Fire Brigade. On London General omnibuses, where the firm have a number of sets always running under close observation, 12 Avons recently gave an average of over 25,000 miles each, and three or four were still running at the time the records were analysed.

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MR. CHARLES SMITH was entertained by the principal officials of the railway and steamship companies to a dinner in the Gresham Hotel, Dublin, on his retirement from the position of secretary of the Irish Railway Clearing House. The occasion was also utilised to present him with a silver salver as a mark of the esteem and regard in which he has always been held by his colleagues. The chair was occupied by Mr. E. A. Neale, Chairman of the Irish Managers' Conference; the vice-chair by Mr. John Coghlan, traffic manager, Dublin and South Eastern Railway: and the large representative gathering proved the regret that is felt at Mr. Smith's retirement.

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AT the annual dinner of the London Society, Sir Aston Webb gave an address on "London of the Future." Treating his subject as though he had slept for 100 years and had awakened in London in 2014, Sir Aston described the conditions he found. Amongst other changes, Cannon Street railway bridge and the bridges at Ludgate Hill and Charing Cross had been taken down and the old railway termini also. In their places two big terminal stations had been built, one for South and one for North London, connected by a tunnel. Besides the railway tracks out of London there were great arterial roads, stretching out in all ways. They were 120 ft. wide, and there were two divisions, one for slow-moving traffic and one for swift traffic. The tramways had been done away with. It is worthy of recall that central termini for London is an old idea, one having been proposed sixty years ago on a site in Farringdon Street, and Charing Cross being selected for a later scheme of a similar character.

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ON the authority of Messrs. Hurst, Nelson & Co., Motherwell, it is stated that during 1913 the railway carriage and wagon building trade in Scotland had certainly a better year than has been experienced for some time, prices not being so seriously cut as recently. There was a good demand for rolling stock in both the home and foreign markets, and a satisfactory share of orders was secured for this country, though foreign competition tends to become greater for colonial work. Good orders are in hand from India. China is moving, and work for South America has been almost continuous. Orders for ordinary passenger stock were scarce, but a good deal was done in tramcars and motor-omnibuses. So far as ordinary traders' wagons are concerned, Scottish builders had to secure these from across the Border against strenuous competition, and while builders were successful enough in taking a considerable amount of work the prices were naturally not highly remunerative. A good demand from this source continues, and builders are hopeful of securing more profitable prices. In view of the Clearing House regulations regarding dead-buffer wagons, the time limit of which expired on December 31st, 1913, there has been an increased business in conversion and reconstruction, and this is likely to be still more active during the present year.

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THE essay which secured the second prize offered by the G.W.R. (London) Lecture and Debating Society, was by Mr. F. R. E. Davis. Its title was, "Are Railway Companies Unduly Handicapped by their Statutory Obligations?" Mr. Davis answered the question in the affirmative, and gave a series of specific examples in support of his contention. Notable among these were the difficulties to be faced by railway companies in the acquisition of land, the burden imposed by the obligation to maintain roads over bridges, and the immediate approaches thereto, and the exactions in the matter of justifying increases in rates to meet growing costs of materials and working expenses. These, and other of the "hardships" enumerated were described lucidly and in a number of instances particular cases were quoted as illustrations.

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MR. WRIGHT RAINES, of the Chief Goods Manager's office, retired from the service of the Great Central Railway Company on January 31st last. On February 9th, Mr. Rostern, the Chief Goods Manager, presented to Mr. Raines, on behalf of himself and the staff, a handsome gold English lever watch, engraved with Mr. Raines' initials on the outside and inside with the inscription:—"Presented to Mr. Wright Raines by his colleagues of the Great Central Railway Company, as a mark of esteem on his retirement after 45 years' service. 31st January, 1914." Mr. Rostern, in making the presentation, alluded to the changes which had taken place since Mr. Raines joined the Great Central Company's service on January 27th, 1869. He stated that at the time Mr. Raines entered the service of the Great Central Railway Company (then the Manchester, Sheffield and Lincolnshire Railway) the mileage of the Company was about 330, including the joint lines, whereas now it was upwards of 1,000. He also pointed out that Mr. Raines' service of 45 years was practically unparalleled, as he had spent the whole of that time in the Chief Goods Manager's office, serving under four Goods Managers, viz., Mr. Ormerod, Mr. Scotter (afterwards Sir Charles Scotter, Bt.), Mr. Smith, and himself. Replying, Mr. Raines mentioned that when he joined the Company in January, 1869, the whole of the Goods Manager's staff comprised 23 clerks, and Mr. Hollins and himself—appointed the same day—made 25. Mr. Ormerod was then the Goods Manager; Mr. Burgess, Rates Clerk; Mr. Torkington, Claims Clerk; and Mr. Crompton, Correspondence Clerk.

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MR. H. GREENLEY, Editor of *Model Railways*, read a paper entitled "Points of View in Model Locomotive and Railway Construction," before the members of the Railway Club on Tuesday, February 10th. He discussed the various points of view taken by model makers and model railway enthusiasts in the development and usage of miniature railway systems. Some have a greater interest in making the models than in working them, while others endeavour to operate a complete service of trains running to schedule. The paper was illustrated by a number of photographs illustrating various types of rolling stock used, chiefly designed and built by Mr. Greenley, whose contribution was much appreciated. The next meeting will be held on Tuesday, March 10th, when Mr. Cecil J. Allen will deal with "Locomotive Hill Climbing." A visit has been arranged for Saturday, March 14th, to the Victoria Docks, to inspect steamers of the Nippon Yusen Kaisha line. Members will meet at Fenchurch Street station at 2.30 p.m.

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ON March 1 the Metropolitan Railway will begin an accelerated express service between Baker Street and Harrow, the journey occupying 17 min. The acceleration of the service has been the object of doubling the lines between these two stations, a work not yet entirely completed. Four sets of rails will, however, be available throughout the greater part of the route. At Harrow steam locomotives will work the trains northward to Aylesbury, Verney Junction, and Brill, as before. The Metropolitan Railway began on February 9 a new service of trains between Hammersmith and New Cross.

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FOR the information of Parliament, the engineer to the Rhymney Railway has prepared an estimate of the capital that will have to be expended in the event of sanction being given to that Company's Bill. The total estimate is put down at only £18,500, which will be spent on a double line, under ½ mile in length, from the Company's Penallta Branch Railway, in Caerphilly, to a junction with the Newport, Abergavenny, and Hereford (Taff Vale Extension) Railway of the Great Western Railway, between Hengoed and Nelson.

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STATISTICS furnished by the Lancashire and Yorkshire Railway show that during 1913 the company paid wages amounting to £2,304,298, an increase of £130,489. The cost of coal during the year was £496,030, an increase of £97,433. Thus the total increase in these two items alone was no less than £227,922.

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HOUSES and cottages for its servants owned by the Great Southern and Western Railway number 1,014. The estimated further capital expenditure on new cottages during 1914 is £6,000.

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IN consideration of seven steam rail motor cars scrapped during 1913, the Great Northern Railway (Ireland) capital expenditure account has been credited £17,700 and a further credit of £7,995 appears on account of 17 carriages burnt in the fire at Dundalk Works, in April last.

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ROAD motors figure largely in the statistics just issued by the Great North of Scotland Railway. The company possesses 8 goods and parcels road motor vehicles and 35 road motors for the conveyance of passengers. Gross receipts from road vehicles during 1913 amounted to £10,702 and the total expenditure in connection with the services came to £9,158. This sum, after allowing £800 for depreciation, provides a balance of £744.

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AT Aberdeen the Palace Hotel and the Station Hotel are owned by the Great North of Scotland Railway, as also is the Cruden Bay Hotel at Port Erroll, Aberdeenshire. During 1913 the company's gross receipts from these hotels and from the sales of provisions, etc., in refreshment rooms totalled £41,397. During the same period

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the expenditure, including salaries, wages, provisions, repairs, maintenance, heating, lighting, rates, taxes and other miscellaneous items, amounted to £30,456. This, after allowing £945 for depreciation, furnished a balance of £9,996.

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THERE are 52 electric locomotives, 165 carriages and 3 ballast wagons in use on the City and South London Railway. During 1913 ordinary passengers numbered 15,313,121 and workmen 5,840,109, season ticket journeys being estimated at 1,570,626. Train miles run during the year amounted to 1,525,528.

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MARCH alterations to the London and North Western Railway time-book show corridor slip carriages, London to Coventry, attached to the 8.40 a.m. and 6.55 p.m. trains from Euston. The carriages arrive at Coventry about 10.25 a.m. and 8.35 p.m. respectively. Passengers travelling by these slip carriages have access *en route* to the breakfast and dining cars as case may be. * * *

FOR the wages staff of the London and South Western Railway a very useful institution is the Supplementary Pension Society, the report and balance sheet of which has just been issued. The second quinquennial valuation shows a solvency of 20s. 6½d. in the pound, thus fully establishing the soundness of the society. One of the most useful features is that a member does not have to wait until he leaves the service in order to be eligible for a pension. In event of failing strength or eyesight, compelling employment at a lesser paid post, a pension can be obtained to bring the weekly income up to or about its former figure. The society's office is at 62, Wandsworth Road, and Mr. J. Claxton is secretary.

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OWING to ill-health, Mr. H. S. C. Ree, Chief Engineer of the Cardiff Railway (Bute Docks), has decided to resign his position on March 31st. Mr. Ree was appointed Resident Engineer in connection with the construction of the Queen Alexandra Dock in March, 1898, and in March, 1902, accepted the position of Chief Engineer of the Cardiff Railway, which post he has held with distinction. Mr. Ree has had exceptional experience as an engineer. He has superintended large contracts in Holland and other European countries, and has earned commendation in exalted quarters.

* * *

ON the retirement of Mr. C. L. Conacher, Traffic Manager of the Cambrian Railways, the following appointments will take effect:—Mr. W. H. Williams will take up the duties of Superintendent of the Line and Mr. W. H. Gough those of Goods Manager. Both gentlemen have had a very extensive experience, Mr. Williams having been in the service 36 years, and Mr. Gough 47 years.

* * *

ON a site of ten acres adjoining the Low Fell storage sidings, a short distance south of Gateshead, a new central permanent way depôt is being completed by the North Eastern Railway. This depôt is intended to replace the existing one at Park Lane, Gateshead, the site of which is to be utilised for general traffic purposes. Eight lines serving the new depôt have direct connections from the Low Fell and Dunston goods line, and the length of new sidings provided is 3,630 yds., the standage being 2,530 yds. and the area of loading docks 9,320 sq. yds.

* * *

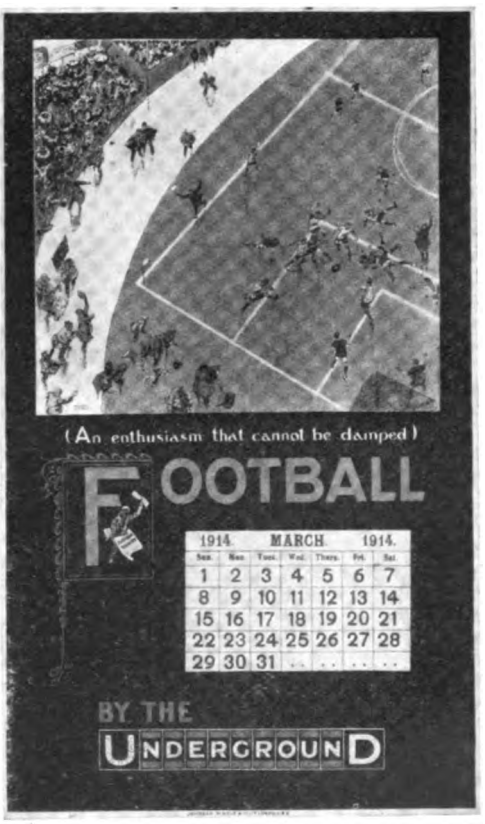
THE Great Western and London and South Western Railways recently announced a useful concession to passengers between London and the Portland district. The return halves of ordinary, tourist, week-end and Saturday to Monday tickets (where such are obtainable) issued between London (Paddington and Westbourne Park or Waterloo and Vauxhall) and Upwey Junction, Rodwell, and Portland, in both directions, are now available for return by either company's route.

* * *

NEW works recently authorised by the directors of the Great Western Railway include the erection at Keyham station of a verandah covering and alcove on the up platform and paving portions of both platforms at present unpaved. At Bradford-on-Avon the up platform is to be extended, and at Kingsbridge both passenger and goods accommodation is to be improved.

* * *

FOR some time one or two of the tank engines used for assisting trains out of Queen Street,



ONE OF THE PANELS FROM THE CALENDAR ISSUED BY THE UNDERGROUND ELECTRIC RAILWAYS COMPANY OF LONDON, LTD.

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Glasgow, North British Railway, have been fitted with slip couplings to avoid the necessity for calling at Cowlairs to detach the pilot; and this practice has been extended so that all trains not booked to call at Cowlairs can proceed without stopping. The following trains are now systematically dealt with in this manner: 7.45 and 8.40 a.m., and 1.0, 4.0, 5.0 and 9.35 p.m., on weekdays; and 10.25 a.m. and 7.50 and 9.35 p.m. on Sundays to Edinburgh; and the 8.50 a.m. and 4.7 and 5.18 p.m. weekday and the 3.50 p.m. Sunday trains to Dundee.

* * *

STEAM locomotives and tenders owned by the Great Northern Railway number in all 1,345, viz.: 876 tender engines and 469 tank engines. Wheel types are as follows: Tender engines 4–2–2, 16; 4–4–2, 116; 4–4–0, 136; 2–4–0, 68; 0–4–2, 49; 2–6–0, 22; 0–6–0, 411; 0–8–0, 55; 2–8–0, 3. Tank engines: 4–4–2, 60; 0–4–4, 58; 0–4–2, 6; 0–6–2, 56; 0–6–0, 248; 0–8–2, 41. The company possesses 939 tenders.

* * *

A MOTOR-CAR, as a mark of the esteem in which he is held by many friends, has been presented to Mr. F. W. Hutchinson on his relinquishing his position as Manager and Secretary of the Portpatrick and Wigtownshire Joint Railways. Mr. Hutchinson's experience in railway work extends over the long period of 57 years.

* * *

DURING the year 1913 the capital expenditure of the Alexandra (Newport and South Wales) Docks and Railway amounted to £128,565, including £1,000 for an additional 0–6–0 locomotive. The estimated capital expenditure for the current year is £50,000 for additional lines and sidings at Alexandra Dock and £130,000 for dock works in course of construction.

* * *

SIR WILLIAM J. GOULDING, Bart., D.L., has been unanimously re-elected Chairman of the Irish Railway Clearing House for the year 1914.

* * *

A READER points out that North British 4–4–2 engine *Holyrood* is No. 904, not No. 890, as stated on page 38 of the January RAILWAY MAGAZINE.

* * *

A CONFERENCE on Railway Nationalisation was held in the Library, Memorial Hall, Farringdon Street, London, E.C., on Saturday, February 7th, at 3 p.m., the Rt. Hon. Sir J. Compton-Rickett, Bart., M.P., in the chair. The first resolution: "That, having regard to the importance of cheap transit and transport to all sections of the community, and in view of the fact that any advantage that may have accrued from competition between the railways is now exhausted, this Conference is of opinion that a national unified system would make for economy, better service and public safety," was moved by Mr. Emil Davies; seconded by Mr. C. Bathurst, M.P.; supported by Mr. L. G. Chiozza Money, M.P., Mr. W. Cunningham, and Mr. J. H. Thomas, M.P. The second resolution: "That this Conference is of opinion that a national system of railways is the only one by means of which the interests of the community can be reconciled with those of the railway-workers," was moved by Mr. A. H. Scott, J.P., L.C.C.; seconded by Mr. G. J. Wardle, M.P.; supported by the Hon. R. D. Denman, M.P., and Mr. A. G. Walkden and Mr. W. W. Rutherford, M.P. In many ways the proceedings were exceedingly interesting, and indicated that this subject is receiving more and more attention.

* * *

A RECORD of 13,183,321 passengers carried during 1913 is announced by the Liverpool Overhead Railway, as compared with 12,168,885 in 1912. Great activity in the trade of Liverpool during the past year has resulted in a steady increase in the traffic of this line, almost every week showing an increase in receipts as compared with the corresponding week of the previous season. The visit of their Majesties the King and Queen, last July, on the occasion of the opening of the new Gladstone Dock, passed off with great *éclat*, and created the abnormally heavy traffic on the Liverpool Overhead line of about 72,000 passengers by rail and tram, this being the greatest number ever carried on one day since the opening of the railway.

* * *

ELECTRICAL equipment of the suburban lines of the London, Brighton and South Coast Railway is now being extended to cover the section between Balham and Wallington, through West Croydon, and good progress has been made with the work since the contract was let. A contract has been made for the supply of the additional rolling stock which will be required, and deliveries will commence during the present year. The agreement regulating the joint service between London and Paris by way of Newhaven and Dieppe expires at the end of the present year, and negotiations have been proceeding between the French State Railway Administration and the Company with the view to its renewal. These negotiations have resulted in the settlement of the terms of a new agreement.

IN a report on American electrical developments presented to the Glasgow Corporation by Bailie W. B. Smith, convener of the Electricity Committee, and Mr. W. W. Lackie, the electrical engineer, it is stated that "the railways running into New York are not allowed to use steam locomotives inside the city boundaries, because of the smoke nuisance. Steam locomotives are therefore taken off some miles out of the city and electric locomotives used for taking the trains into and out of the terminal stations. The electric locomotive, besides emitting neither smoke nor steam, has the further advantage of running silently. In Boston the Edison Illuminating Company supply lighting and power, and the Boston Elevated Railways supply energy for the tramways and electric railways. We were told that the Elevated Railway Company hold the record in America for economic coal consumption, and we were impressed by their elaborate attention to detail in boiler-house equipment, some of which we may be able to adopt. It has to be borne in mind that the class of coal available is a prime factor in this connection. What is practically anthracite coal of a very high calorific value is used in Boston."

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ANOTHER section of the north and south Trans-Australian Railway has been approved by the Federal Parliament. The Act provides for the expenditure of £482,000 on the extension of the Port Darwin to Pine Creek 3 ft. 6 in. railway to the Katharine River, a distance of 54 miles. This line will go over admittedly poor country, but beyond the Katharine river the character of the soil and country generally changes completely, and a very large area of fine land eminently suited for pastoral purposes will be brought into communication with the seaboard. While the line will be constructed on the 3 ft. 6 in. gauge, all earthworks, bridges, etc., are to be made sufficiently wide to allow of the gauge being increased to 4 ft. 8½ in., which is the gauge of the Trans-continental Railway connecting Eastern Australia with West Australia. Great difficulty is expected in obtaining suitable labour for the construction of the line, as the climate, though healthy, is tropical. The work, however, will be done by white labour, as it is against the policy of the Commonwealth to employ indentured coloured labour. It is hoped that the influx of a large number of white people will lead to the settlement of the country, as no doubt special inducements will be given to those working on the railway to take up land. The section of the line from Port Darwin to Pine Creek was constructed some years ago by the South Australian Government, Chinese labour being employed.

* * *

IT is claimed that the busiest railway terminal in the United States is the South station, Boston, Mass., where more trains, passengers, baggage, and postal matter are dealt with daily than at any other station. The largest railway station in point of size is the recently completed Grand Central terminal in New York City. These two stations are at the termini of the New York, New Haven, and Hartford Railroad, which shares the former station with the Boston and Albany Railroad and the latter with the New York Central Railroad. According to the *Times* correspondent, the total number of passengers in and out of the South station from July, 1912, to June, 1913, exceeded 28,000,000; the number in and out of the Grand Central exceeded 22,000,000. Almost twice as many trains are handled each day at the South station as at the Grand Central, but in the number of cars the latter leads. The passenger facilities of the Grand Central station are far from taxed, although at the present time about 62,000 persons use it daily; when it is completed it will have a capacity to handle 70,000 an hour. Twenty-one tracks have still to be completed, whereas at the South station in Boston all the tracks are now in use with the exception of two suburban loops, the operation of which must await electrification.

* * *

EXPRESS trains twice a week now carry passengers between Tientsin and Shanghai in about 43 hours. At Pukow the River Yangtze is crossed in a steam ferry to Nanking and thence the train to Shanghai is taken. Were closer connection made between the times of the trains on the two lines the journey might be shortened by some seven hours. As already stated in the RAILWAY MAGAZINE, the designation of the Chinese Government Railways Peking-Mukden line, has been changed to the Imperial Railways of North China. The British representative at Tientsin expresses surprise that no mention is made in the annual report of the protection to the railway afforded by the foreign troops of the various Powers, and he says that had it not been for their active measures the line would undoubtedly have been wrecked. The revenue was £1,373,295 and the working expenses £397,484, or 28·9 per cent., as against £1,021,005 and £319,474, or 31·3 per cent., in 1911. In 1912 the sum of £658,360 out of the profits was paid to the Chinese Government as against £619,992 in 1911. The sum of £636,578 was carried forward as balance to 1913. A survey is being made by a British engineer for a branch line from the southern section of the Tientsin-Pukow Railway to Hsin Yang Chou on the Peking-Hankow line.

* * *

IT is officially reported from Kobe (China) that the remarkable growth in the value of imported rails, locomotives and railway carriages in 1911 was followed by a strong reaction in 1912. A large quantity of rails had been ordered to arrive in time to avoid the heavier duties so that the consequence was a falling-off in value to the amount of £96,878. As to locomotives and parts thereof, they only registered a total of £12,115. There was a complete cessation of the importation of railway cars. The requirements of the railway authorities had been satisfied in the meantime, and though there existed a considerable demand for material for light railways started in 1912, this will not be apparent till the figures for 1913 are published. There is an inclination on the part of the Railway Bureau to prefer the steel rails turned out by the Government foundry at Wakamatsu, and that establishment is going to enlarge its plant. An Osaka newspaper had raised objection to this policy, pointing out that the cost of the officially produced rails was the same as that of British rails, notwithstanding the greater durability of the latter.

* * *

FOR some time past, the Canadian Pacific Railway has been equipping all its switching locomotives with fire fighting apparatus, and in addition to this being ordered on all new switching equipment, orders have been issued to add it to all of that class as they come in for shopping. At the end of last year, there were on all parts of the system, 162 locomotives so equipped. The equipment is standard, apart from the method of installation on old and new locomotives. There are three different styles. Each locomotive is equipped with 50 ft. of canvas hose for attachment to a Y connection. With the pressure of the water, provided by the injector, a stream can be thrown for a considerable distance. Each locomotive is also equipped with a nipple threaded to fit the local hydrant of the place where the locomotive is stationed, so that the hose may be used on the local service when the water in the tender has been exhausted, or when it is otherwise deemed expedient to do so.

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Railway Literature.

STATE PURCHASE OF BRITISH RAILWAYS: THE PRICE TO BE PAID. (The Boswell Printing and Publishing Co., Ltd. Price 6d.) This pamphlet is mainly a reprint of articles published in the *Railway News*. The bearing of the Act of 1844 upon the State purchase of railways is carefully discussed, as well as other Parliamentary and legal aspects of the matter. A list of the railways in existence in 1844 will be useful for reference, as also the map bearing that date. Railway finance, in so far as the subject requires it, is carefully considered, and it is deduced that on the basis of financial statistics for the year 1912, the total cost to the Government, in the event of the railways being purchased as they are, would be £1,759,818,405. To give a return of 2½ per cent. this would absorb £43,995,460 out of the corresponding annual net revenue of £45,625,657. In conclusion the probable financial effects are set forth. This pamphlet may be commended to the consideration of readers interested in a subject which will, in all probability, become a very live issue at an early date

* * *

LOCOMOTIVE MAGAZINE SOUVENIR, No. 23. (The Locomotive Publishing Co., Ltd. One Shilling Net). These souvenir publications, each consisting of a set of collotype illustrations tastefully bound in art cover, are deservedly well known. No. 23 of the series deals with Canadian locomotives, including the first engine built by the Canadian Pacific Railway (an old 4–4–0), a still older 4–4–0 locomotive, No. 209, *Trevithick*, built for the Grand Trunk Railway in 1859 and which worked the Royal train in 1860, and representative 4–6–0, 4–6–2, 2–8–0 and 2–8–2 engines belonging to various Canadian lines, with the 0–6–6–0 articulated design introduced recently on the Canadian Pacific Railway.

* * *

THE RAILWAY CARRIAGE AND WAGON BUILDERS' POCKET BOOK AND DIARY, 1914. (The Locomotive Publishing Co., Ltd. Price 2s. 6d. net.) This is a companion to the Locomotive Engineers' Diary and Pocket Book reviewed last month, designed to meet the requirements of the carriage and wagon department. In addition to the diary and pages of squared paper for sketches, there are lists of the carriage and wagon superintendents of all the home railways and nearly all the Colonial, South American, and other foreign railways in which British interests are concerned, with a wide selection of tables and practical articles on subjects concerning which information is required.

* * *

BOILER CONSTRUCTION. By F. B. Kleinhans. (Locomotive Publishing Co., Ltd. Price 12s. 6d. net). This volume is now issued in a revised and enlarged edition, with additions by Mr. G. L. Fowler. It is based professedly on American methods, but is of a particularly practical character, dealing with boiler-makers' work, the layout of sheets, rivetting and punching, allowances for bending and flanging sheets, with consideration of workshop conditions and organisation, boiler inspection, and other facts. A section on boiler shop machinery is included, and the tables appended constitute by no means the least valuable portion of the book. Locomotive boilers receive considerable attention.

* * *

SAFETY FIRST. By G. Bradshaw. [The Hill Publishing Company, Ltd. Price 2s. net.] This volume, by the author of "Prevention of Railway Accidents," is intended to support the "Safety First" movement now being strenuously advocated both here and in America. This work is designed to contribute to the advancement of this campaign by calling the attention of the employé to safe and unsafe practices and conditions, with proper comment, in order that he may be better enabled to profit by the experience of others. The subjects of illustration relate to the performance of routine duties and matters of everyday occurrence, the author pointing out the ways in which accident may arise, and suggesting the best ways to avoid them and to prevent their recurrence.

Photo] [*E. S. Hallett.*

LONDON AND SOUTH WESTERN RAILWAY:
10.35 a.m. Waterloo-Bournemouth train leaving Farnborough. 4–4–0 locomotive No. 418.

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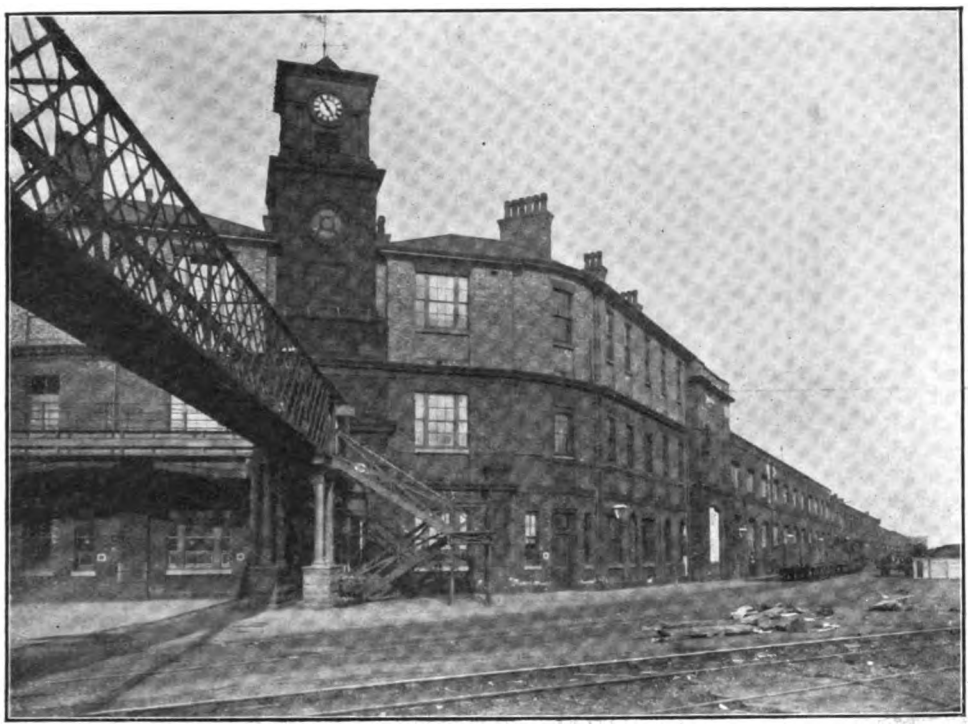

THE LOCOMOTIVE OFFICES AND MAIN AVENUE.

Derby Locomotive Works: Midland Railway.

By J. F. GAIRNS.

AS one of the four "largest" railways in Great Britain—the others being the London and North Western, Great Western and North Eastern—the Midland Railway is a very important factor in the traffic and industrial economy of the country; but, apart from the magnitude of its operations, it is probably the most remarkable system in the United Kingdom, besides being unique in several respects. Midland mileage is comprised in all four kingdoms, in England, Wales and Ireland by direct ownership, in Scotland by virtue of joint partnership in the Portpatrick and Wigtownshire Railway and a share in the Forth Bridge; its tracks extend into most of the English counties, and every joint railway which is separately constituted, and which possesses its own locomotives or rolling stock or both, acknowledges the Midland as one of its owners. Steamers and docks account for further activity in Midland enterprise; hotels, some of them of a peculiarly notable character, are owned and operated by this company; it is concerned in two widely separated electrically operated sections, using different systems of traction; in the Burton and Ashby Light Railway the Midland Railway operates what is virtually an electric tramway; and in respect of traffic, its list of running powers is a formidable one, while Midland locomotives and Midland passenger carriages are to be seen in nearly every important centre in England and Scotland, besides making extended journeys in Wales and Ireland.

Altogether Midland enterprise covers the maintenance of some 2,000 miles of line, more than 3,000 locomotives are owned, while carriage stock amounts to nearly 7,000 vehicles, and goods rolling stock to the enormous total of about 120,000 wagons of various classes. The construction and upkeep of rolling stock on this scale calls for elaborate and extensive plant; and in this respect the Midland is unique among big companies in that executive, traffic, construction and

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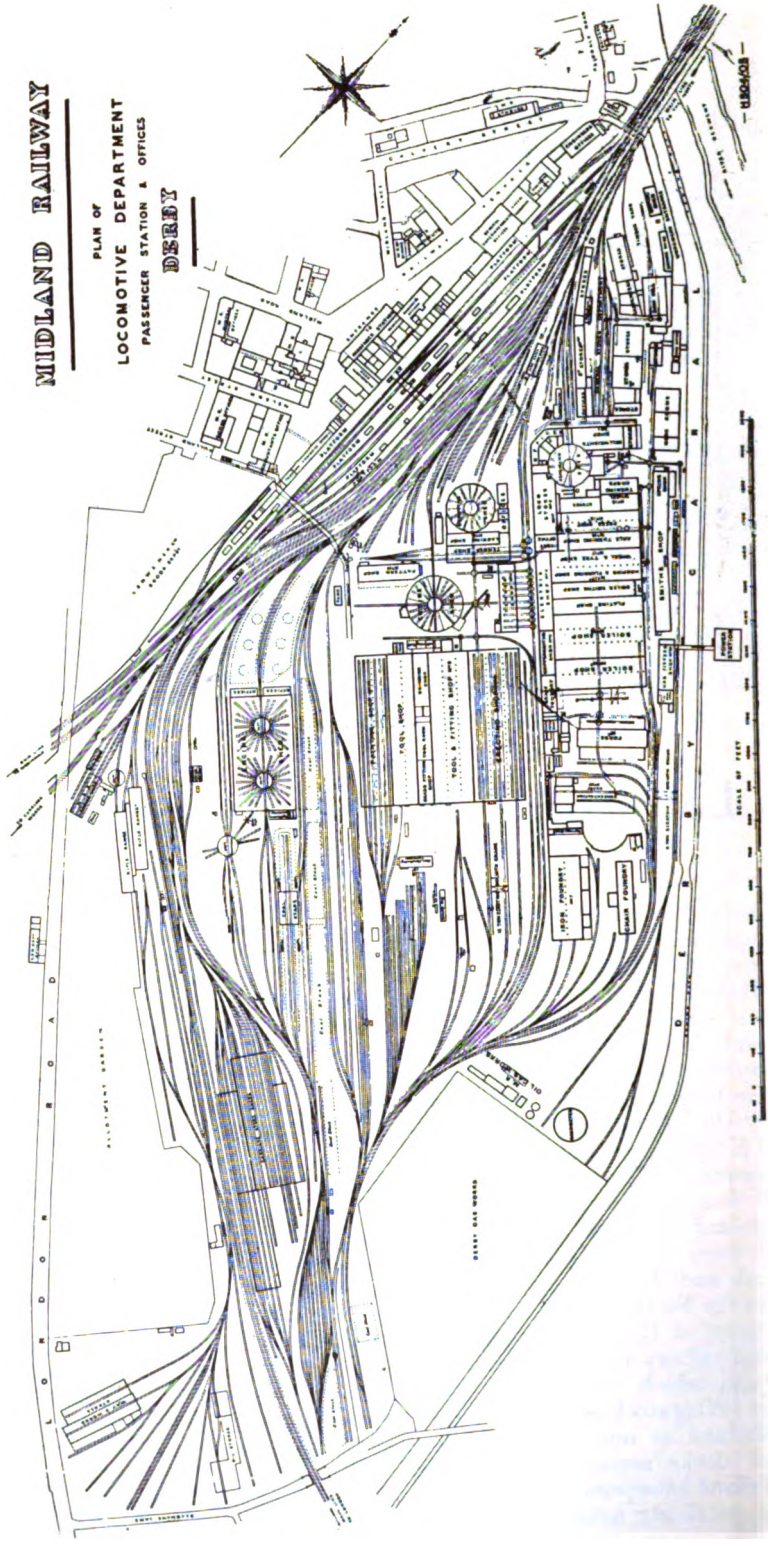

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maintenance are all concentrated at Derby, geographically and operatively the "hub" of a system which radiates in all directions therefrom. It is true that in Ireland separate establishments are maintained, just as in various places there are subsidiary offices and shops ; but this does not alter the broad statement, that Derby is the mainspring of Midland activity, central for almost every district, and the scene of converging traffic to and from all parts of the Kingdom.

In the days when the North Midland, the Midland Counties and the Birmingham and Derby Railways were separate organisations, the town of Derby provided a suitable meeting place ; and the selection of this old-world town as head-quarters, on amalgamation in 1844, was the natural outcome. Indeed, the three companies mentioned had already located their works at Derby, all being close together and comprised in the area now given over to the Locomotive Works. Some of the old buildings dating from this record are still in use, though now so enclosed that they may almost escape notice, except for certain peculiarities of construction indicative of their age.

The area then covered was about 8½ acres, providing for both locomotives and carriage and wagon stock ; now the area covered by buildings is about 20 acres, with ground amounting to about 80 acres, devoted to the locomotive department alone, the carriage and wagon works having been transferred to a new site adjacent in 1873, and now vying with the locomotive section in magnitude and extent of operations. In view of the fact that engineering, signal, stores and other departments are also located at Derby, it is not surprising that altogether about 12,000 men and boys in Derby depend for their livelihood upon the Midland shops and offices, with a considerable number of men engaged in the traffic-working departments.

Historically, the town of Derby possesses great interest. It is supposed to date back to before the Christian era, and in Roman days it possessed certain importance. But although Derby has attained a degree of development apart from the Midland Railway, and several manufacturing and trading firms are now located there, it is as the Midland headquarters that the town ranks among the great centres of traffic and industry.

Mr. Fowler is responsible only for the construction and maintenance of the locomotives and for a certain amount of work done for other departments, the running department being under Mr. Cecil Paget, General Superintendent. But as Chief Mechanical Engineer Mr. Fowler has about 4,500 men and boys under his direction. The output of rebuilt and in many cases largely reconstructed locomotives last year was 120, no new work being completed ; but the capacity of the works will allow of about 80 new engines being turned out, with a usual proportion of rebuilt and repaired locomotives. The principal officers under the Chief Mechanical Engineer are the Chief Clerk, who is responsible for all clerical assistance, though attached to various divisions, the Works Assistant, the Chemist, Works Accountant, Chief Locomotive Draughtsman, Chief Draughtsman for general and electrical work, and others ; with assistants and inspectors as required.

The locomotive works are located adjacent to the station, and are reached in that direction by means of two footbridges crossing the platforms and intervening lines. One, situated at the south end of the station, is used by workmen ; the other, located about the middle of the station, and with connections from all platforms as well as from the station yard, but clear of ordinary station traffic, leads directly into the departmental offices, and is reserved for clerks, draughtsmen and chief officers. The main entrance for workmen is alongside the canal close to where the railway crosses, north of the station. The time offices are placed at this entrance.

From the station the main office building immediately attracts attention, surmounted as it is by a clock tower visible in all directions. It constitutes the corner of one of the two principal groups of shops attached to the locomotive department. The offices are on three floors. The first storey, reached directly from the staff footbridge beforementioned, includes Mr. Fowler's private rooms, and the correspondence and locomotive accountant's sections ; while on the second floor are, on one side the locomotive drawing office and on the other the electrical and general drawing offices. On the ground level are the staff and works, gas, various inspectors' and other offices, the total staff here numbering about 300 assistants of all grades.

In the angle between the railway and the canal, to the north-east of the station, is a group of buildings mostly devoted to the Stores Department. Alongside the canal,

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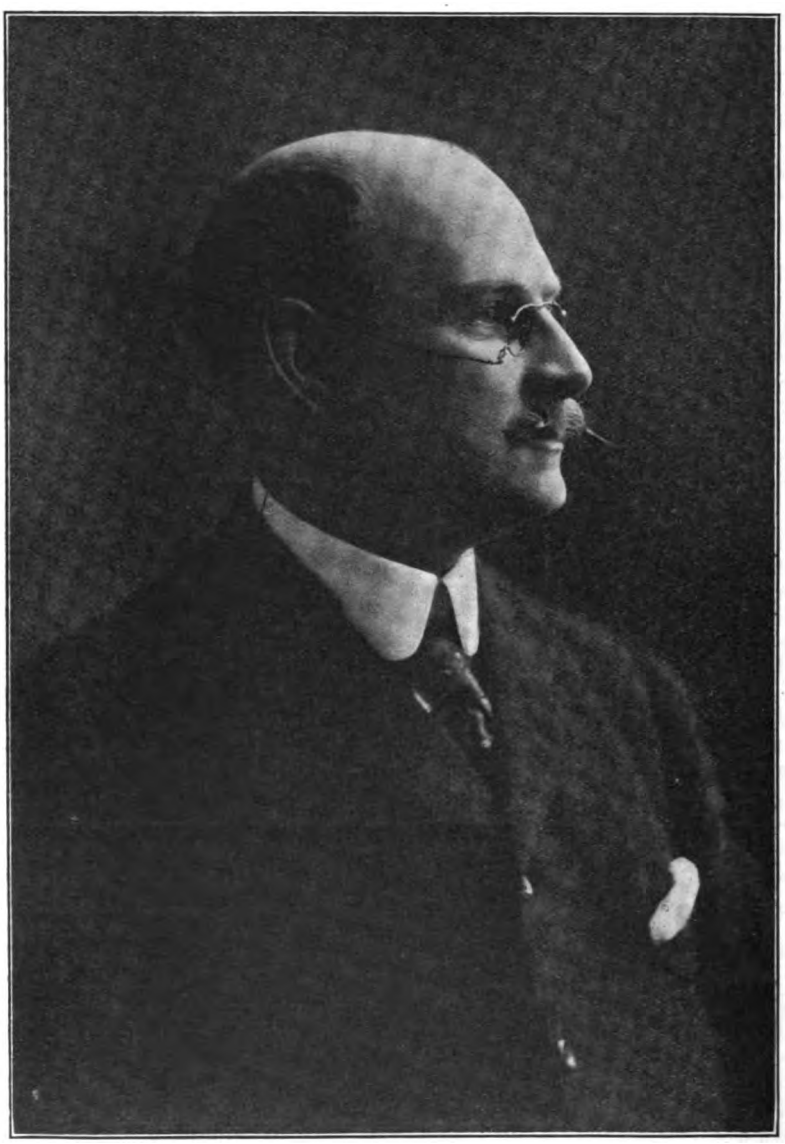

Photo] [*W. H. Winter.*

MR. HENRY FOWLER.
Chief Mechanical Engineer, Midland Railway.

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beyond the main entrance, are the workmen's mess rooms, the smithy and spring shop, and the gas fitters' shop. Here the ground is several feet lower than it is along the main avenue south of the offices, so that the large block of shops extending from the offices in a south-eastern direction is on two levels, the departments immediately fronting the main avenue and to the south thereof being on the higher ground. This portion of the works extends for about 900 feet, and beyond are several buildings, more or less isolated, constituting the forge, concentration depôt, iron and chair foundries, photographic department, etc. On the other side of the main avenue are the tender shops, the foremen's mess room, a few offices, two round-houses, one used as a stripping shed, the other still attached to the running department for goods engines in service, the pattern shop, and the big building which includes the erecting shop, the tool, fitting and machine shops, and the paint shop.

It will be most convenient to commence with the various divisions included in the block of shops adjoining the main offices, visiting first those on the lower level. Immediately behind the offices is an old round-house dating from North Midland days and believed to be the oldest building still existing in the works. It is now used for light boiler repair work. The curious design of the roof, with timber beams and struts, at once attracts attention. The millwrights' shop adjoining the north-eastern end of the offices is of considerable size and contains the usual assortment of machines and tools, these serving most requirements, notwithstanding the miscellaneous character of the work done.

The adjacent yard is used for general purposes, and we then come to the wheel shop. The first division is relatively short and contains mainly a number of wheel lathes, driven by belting from electric motors mounted on wall brackets; in the centre is a large double chuck lathe, in two sections, each head operated by its own electric motor, and capable of dealing with the largest wheels in use—7 ft. 9 in. diameter. There are also two centre-drive double-head lathes, and a few other wheel and tyre machines. An overhead electric crane serves this shop.

A similar bay adjoining this contains a further selection of wheel lathes of various sizes, they being electrically driven. All these shops, in common with the other shops in the Works, are served by electric cranes. The next, or Press shop, is considerably longer than those just mentioned, and consists of a double sprung roof carried down the centre by means of pillars. It is mainly devoted to the assembly of wheels, axles and cranks, and contains the necessary machines for the purpose. There are in it two wheel presses, each of which is fitted with an automatic recorder which registers the pressure at which the wheels are pressed on to the axles. Recently there has been fitted up in this shop a large quartering machine for boring out taper crank pin holes with the wheels in position, thus ensuring accurate quartering. The Midland custom is to fit a "safety" pin through the big end journals of the forged cranks, and this machine is so arranged that the drilling and tapping necessary can be carried out in it. In the first bay of this shop there is also provided a special lathe for drilling crank pin journals accurately without dissembling, and a number of centres for testing wheels for truth. In the second bay of the Press shop is situated a loading platform which is utilised for transferring material from the locomotive stores, which lie at a higher level, into railway wagons.

At the end of the axle turning shop is a lift, by means of which wheels may be readily transferred to and from the main avenue of the wheel shop. Near this is a new heavy wheel lathe, specially designed to deal with a large number of tender wheels during the day. The rest of the shop is mainly devoted to axle turning, but also has in it a large and powerful capstan lathe, used for turning crank pins from the solid bar. It also contains machines for milling key-ways, and the usual locomotive crank nibbling machines, originally designed by John Ramsbottom, the well-known Crewe engineer. In this shop there are enclosed stores, in which the tools used by the wheel shop are ground and stored.

Beyond the dividing wall is the wheel and turning shop, separated by roof pillars. Here are situated a number of machines specially designed for drilling and tapping holes between the spokes and through the rims of locomotive wheels, in which studs are inserted for assisting in securing the tyre on the rim. These machines also serve for drilling tyres to enable their being split and removed.

At the end of the shop a battery of boilers had just been taken out previous to my visit, as these are not now required, electric

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Photo] [*W. H. Winter.*

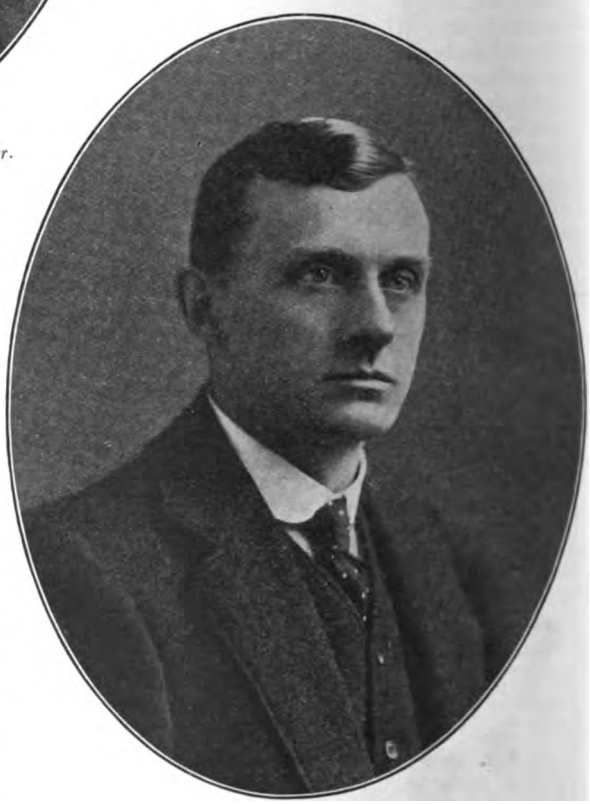
MR. J. E. ANDERSON.
Works Assistant, Midland Railway Locomotive Works, Derby.

motors having been installed for shop driving. Electricity, it may be mentioned, is wholly used at Derby for supplying the power employed in the Works. The site of this battery of boilers is being utilised for the tyre furnace for heating tyres previous to their being shrunk on to the wheels. This furnace is at present at the end of the flanging shop.

Beyond the site of where the tyre furnace is to be fixed, is situated a large air compressor—one of several in various parts of the works—for supplying compressed air to pneumatic tools; this, in common with the others, is electrically driven.

Coming to the flanging shop, I noticed a series of straightening rolls at one end, a 260-ton Tweddell press, with gas-fired furnace adjacent, flanging tables, angle bending appliances, and a small flanging press. Changes are in progress here, for the installation of a big 500-ton flanging press. This will be served by two gas-fired furnaces, one old and one new, these and other furnaces here being supplied with gas from Dowson gas producers outside the building.

At one end of the boiler-smiths' department is the rivet and bolt shop with four oil-fired furnaces, various machines for making rivets, nuts, bolts and boiler stay pins, and a selection of saws, swaging machines, and one or two old-fashioned hand strikers. In the boiler-smiths' shop proper are 14 hearths, 1 steam hammer, and a small new hydraulic press for making foundation and fire-hole rings, besides an older but larger one used for general purposes. At the other end are placed several large grindstones The remaining divisions in this section of the works as far as this range of shops is concerned, may all be classed as pertaining to the boiler



Photo] [*W. H. Winter.*

MR. S. J. SYMES.
Chief Locomotive Draughtsman.
Midland Railway Locomotive Works, Derby.

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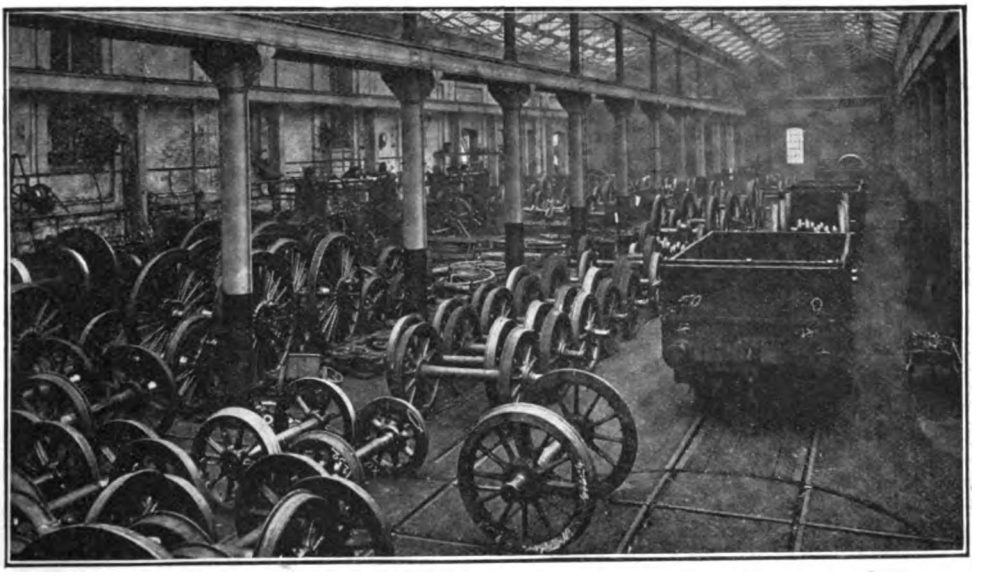
department, in three principal sections: the plating shop, boiler shop (three bays), and boiler mounting shop (two bays). Some of these bays are given over to boiler machine work. In the first division may be noted a series of drills, many of radial type and of considerable size, for drilling foundation rings, tube plates, fire-hole rings, and other operations. Of special importance are three large radial drills and two countersinking rivet-hole drills. As regards other machine tools, there is a large duplex horizontal saw for trimming the edges of flanged plates; a big vertical boring mill with oscillating table, for making oval holes; two large plate edge planers; a circular cold saw; another horizontal duplex saw; a band-saw for metal; a duplex planer for roof bars; two large two-head slotters; punches and shears; besides various other machines. In the corner are two boilers supplying steam for heating these shops. Several small hydraulic cranes of swinging-arm type are provided to enable plates to be manipulated.

In the large boiler shop the first bay contains several interesting machines, including a large triple-head multiple drill, there being six drills on each head, making 18 in all; and two four-drill machines for drilling holes in boiler barrels and plates in a horizontal position. There are also two large machines for shearing, punching, and V-ing angle iron, and vertical and horizontal rolls. In the corner is the accumulator for the hydraulic plant.

In the same bay are two vertical standard drills for drilling holes horizontally in foundation rings. At the end is the hydraulic rivetting plant, with a usual rivetting tower, a crane serving it with special electrical control, a special rivetting machine, furnaces, and other usual equipment. In cellars adjacent is a boiler shop sub-stores.

In these divisions a few other machines are placed as convenient, but remaining space is principally given over to boiler rivetting, erecting, repairs and like operations. Pneumatic rivetting and caulking tools are largely used, the necessary connections for air supply being provided on a liberal basis. Along one of the end walls are the foreman's offices. These consist of two storeys, the top floor being for the chiefs and accommodation for clerks below. One section of the shop deals with tender and tank work, including gasholders, ashpans and miscellaneous items. Another division is used mainly for boiler repairs. Near here are machines for tapping copper stay holes and screwing the stays themselves in. A pit enables fireboxes to be placed on a lower level for fixing and fitting roof bars to fireboxes and for convenience in boiler patching. Reference may also be made to a large horizontal tapping machine, specially adapted for working on Belpaire boilers. A large



THE PRESS AND FITTING DEPARTMENT OF THE WHEEL SHOP.

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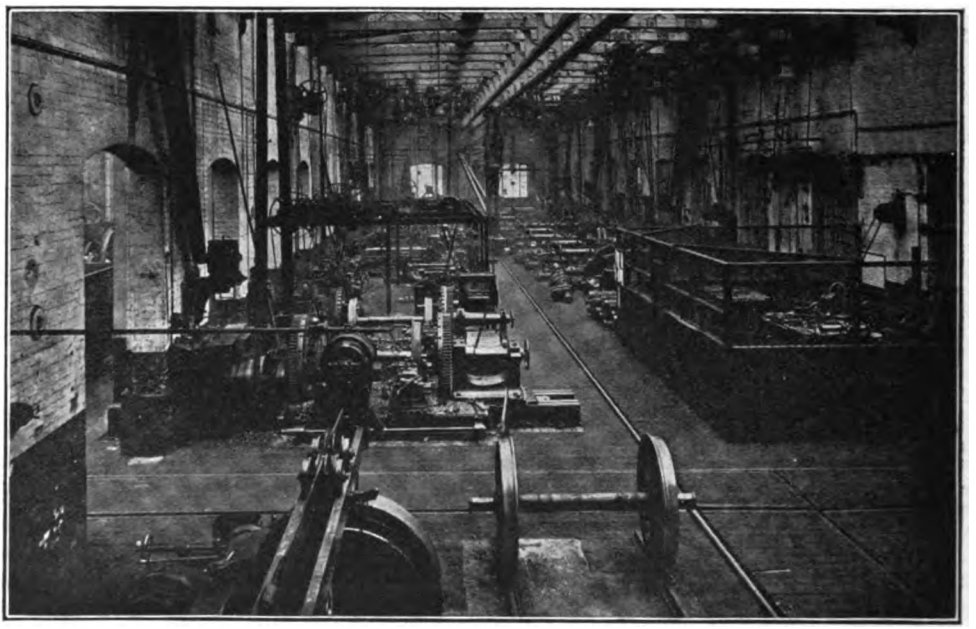
multiple drill, with two heads carrying four drills each, may also be noted, besides several radial and other drills. This section has two overhead cranes. In the boiler mounting shop adjacent are two 25-ton electric cranes. In this division fittings are mounted on boilers and tubing carried out. Superheaters are also now dealt with here.

Returning to the office building the departments extending therefrom on the north side of the main avenue and adjoining the shops which have already been considered, may now be visited. The locomotive stores first call for attention. This is a large department, with several entrances. Part is partitioned off by a counter guarded by expanded metal netting. Behind are series of racks and shelves for parts, details and fittings of all kinds, with tanks and cisterns for oil and other liquids. Along the bays formed by the racks and shelves travelling electric lights are provided, suspended from overhead rails, so that current is obtained in all positions. At the end of this section is a division for despatching to out-stations, while adjacent thereto is an opening leading to the platform in the wheel shop for loading and unloading previously mentioned. The second floor of the stores building is utilised in the same way, two lifts being installed for communication. This division communicates with that portion of the offices dealing with stores, a very important section in view of the special system of organisation and shop methods in vogue at Derby. In connection with this system a special catalogue is employed, whereby every standard item, whether required for the works or to the order of an out-station repair shop or depôt, can be distinctly indicated by its code number and letter, thus materially facilitating the conduct of operations, especially as in the case of parts subject to wear variations of dimensions are also provided for.

The testing shop is an interesting department, particularly well equipped. Here are two file-testing machines whereby the work done by mechanically operated files can be measured; a 4-ton tensile testing machine; a 15-ton lever testing machine; a big 50-ton hydraulic testing machine; a torsion testing machine; a rubber testing machine; a machine for giving alternating stresses; and a few other appliances. An accumulator and pump provide hydraulic pressure, while small electric motors are used for running the pumps and such machines as require them. Adjoining the testing shop proper is a division with a few tools for preparing specimens.



THE AXLE TURNING SHOP.

Just beyond the testing shop is a curved line of rails, used for conveying wheels and

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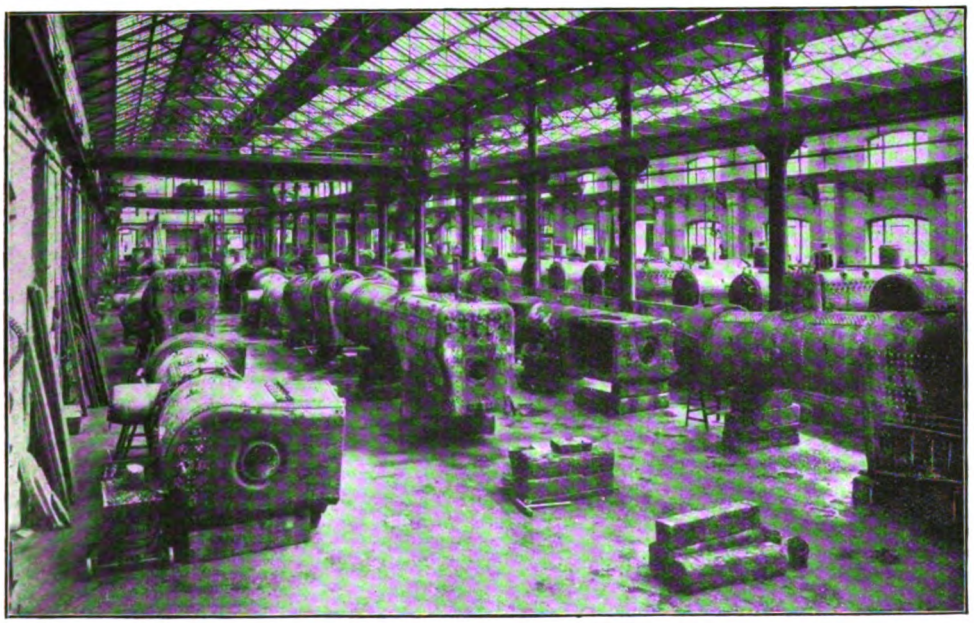
axles from the tender shops and leading to the wheel lift in the axle turning shop before referred to. In order to safeguard traffic along the main avenue when wheels are thus being transferred, automatic lamp signals are displayed according to the condition of traffic, and at the same time a rod carrying a red flag is raised or lowered.

We now come to the electric shop, a fairly large department, though as yet little is done in connection with electric traction, the principal work being shop motors, cranes, and electric appliances used in various parts of the system. In the centre is a testing plant, and two vacuum insulation machines At one end are several tools, planers, lathes, drills, shapers, etc., and at the other end armature winding is done. There are also insulation stoves and other appliances. A 5-ton overhead crane supplies lifting and transportation. At the time of my visit a small electric accumulator locomotive, equipped with batteries, was undergoing trials. This is now used in the West India Docks for light shunting, in place of horses, its small dimensions being selected in view of the work to be done and to enable it to be raised or lowered in wagon hoists from one level to another as required.

In the coppersmith's shop the work is of usual character and only a few tools and appliances are required. For ventilation each hearth has an overhead funnel or chimney connected to a conduit exhausted by a fan. The brass foundry adjoining has one cylindrical furnace and three crucible tilting furnaces for melting, giving a capacity of about 18 tons of finished brass per week, with six heats a day from 600 lb. pots. The pots for transferring metal from the tilting furnaces to the moulds are heated in coke furnaces, the other furnaces using a mixture of oil tar and crude petroleum. Exhausting funnels or chimneys are provided over the furnaces. Outside this building, near the erecting shop, are underground storage tanks for the fuel. In the brass foundry there are six moulding machines, either pneumatic or hydraulic.



THE BOILER SHOP.

Sand blast and coke crushing machines, with fettling wheels, are included in the equipment of this shop. There is also a small core oven. Adjoining is the white-metalling shop, where brasses are metalled and similar work done.

Crossing the main avenue the big square building accommodating the erecting, machine and paint shops may now be visited. The erecting shop is in three divisions or bays, each having three roads, served by electric overhead cranes, three of 25 tons in each of the two north-east bays, and two 50-ton and two 10-ton cranes in the bay nearest the machine shop. In the latter case the smaller cranes can pass under the larger ones, their purpose being to convey wheels

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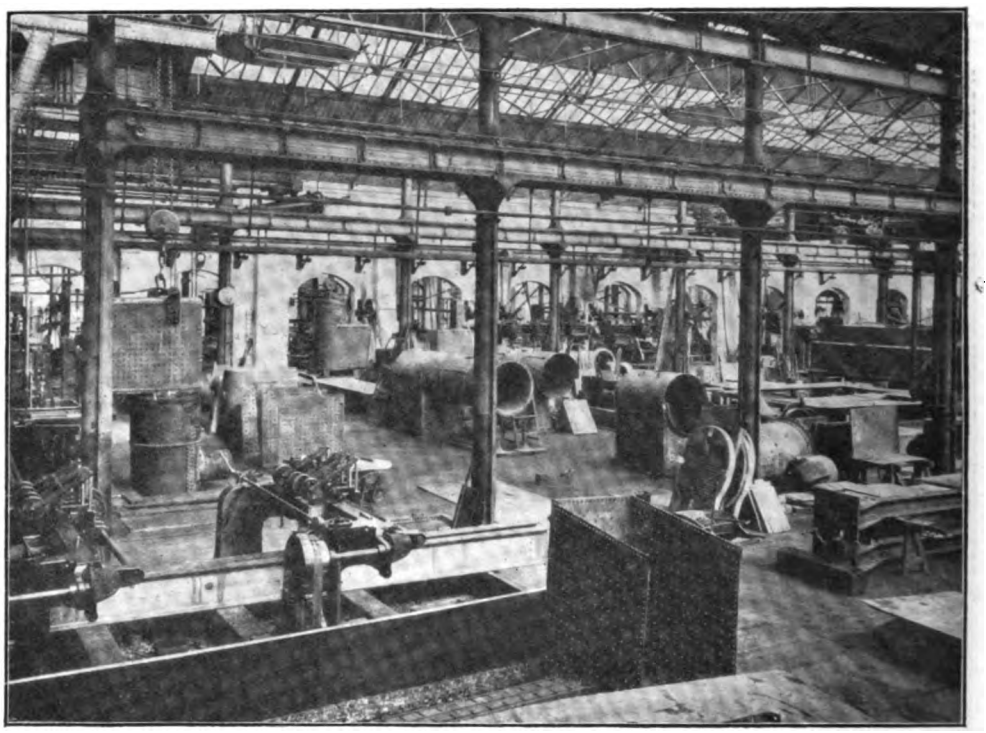
and parts, while the others can lift a complete locomotive of the largest size. The 58 pits used for erection are supervised by fifteen leading hands.

A special feature of this shop and also the machine shop is the fact that they are honeycombed below with stores cellars, sectioned so that each division has its own sub-stores for ordinary and standard parts, tools and materials, and it is only necessary to deal with the main stores for special parts and fittings. These cellar stores are reached by narrow stairways between the bays. Between the two northern divisions cylinders before engines are definitely allocated for repair.

At one end of the erecting shop is the chief foreman's office, in a neat erection with clerks' office below. Near this is a board showing the numbers of all engines in the shop, and their positions. Between the divisions are a few tools as well as fitter's benches, but, as usual, little special equipment of this class is called for here. Portable cylinder-boring and valve-facing machines, single and duplex, and other appliances are, of course, in use. Oxy-acetylene welding and cutting appliances are used here, as also in



ANOTHER VIEW IN THE BOILER SHOP.

is a special gauge store, where is provided a very large selection of gauges of all kinds for ascertaining that almost every part of an engine is correctly placed or correctly dimensioned as the work of erection proceeds. These gauges not only provide for checking constructional dimensions, but also for variations involved by repair and rebuilding operations. There are also devices for checking the gauges, and after use every gauge is thus examined to see that it has not been damaged or rendered inaccurate in any respect. A section of the erecting shop is devoted to the examination of frames and the tender shops. At the time of my visit, two of the big 2-8-0 engines under construction (the order is for six) for the Somerset and Dorset Joint Railway were being erected in the bay devoted to large engines. The first of the class had already been completed, and was undergoing steam trials in the yard. There are altogether pits for 58 engines in this shop. Among the various engines in for repair here, I noticed several locomotives belonging to the London, Tilbury and Southend section.

The tool and fitting shop is a splendid building, high-roofed, well lighted and con-

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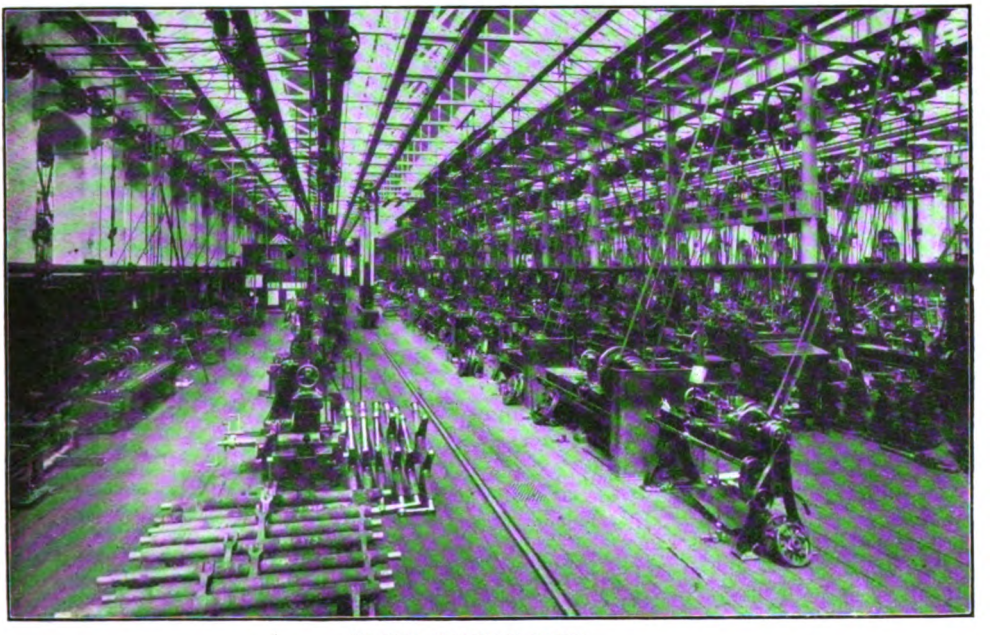
veniently arranged. In the main division there are three bays, and these may be followed in order, commencing with that next the erecting shop. At the end a space is given over to bench work, the benches being arranged diagonally instead of transversely as usual. This method is adopted in several instances at Derby, for machines as well as for benches, as it gives increased length without reducing the width of the central passage way, and is convenient in other ways. On one side these benches deal with motion work, fitting up and finishing connecting, eccentric and other rods, eccentrics, and so on; while on the other side axle boxes, brake gear and other assembling and finishing work is done. Down the centre of the bay runs a 3-ton electric walking crane.



IN THE MACHINE SHOPS.

Beyond the fitting division is a section containing miscellaneous tools, including facing lathes, slot drilling or "wibbling" machines, piston rod grinding machines, radial drills, a slotting machine, a 3-head frame slotter, straightening tables for frame plates, plant for testing cylinders and superheater headers, and various other appliances.

The next bay is wholly given up to machines and tools, and is served by a 3-ton electric walking crane running from end to end along the centre rails. At one end are several of the largest machines in the works. On one side is a very big frame slotter, capable of taking 10 pairs of frames (20 in all) at once. It has a 56 ft. bed and four slotting heads. Next is a smaller slotter, and then a two-head slotter used mainly for dealing with flanged plates. Opposite these machines are several large drilling machines for frames, including one with three radial arms. Along the same side is a series of machines for boring piston valve casings, brake cylinders and the like, with various slotting, boring, crank-shaping and drilling (ordinary and slot) machines. Further along I noticed a press for forcing bushes into and out of rods and bearings, and three single or double lapping-out and link-grinding machines. On this side a battery of three plain grinders for pins and motion work may be noted.

On the other side of this bay are various shaping, drilling, slotting and other machines for boring piston rings, bushes and other work. In an enclosure are several vertical boring mills for white metal liners, etc. Other machines adjacent include radial drills, high speed shapers, lathes, axle box boring mills, facing and turning and planing tools, etc. At this end are several marking-off tables, and bins for scrap metal.

In the third bay there is at one end an enclosure where pressure and vacuum gauges are tested, and adjacent are benches for

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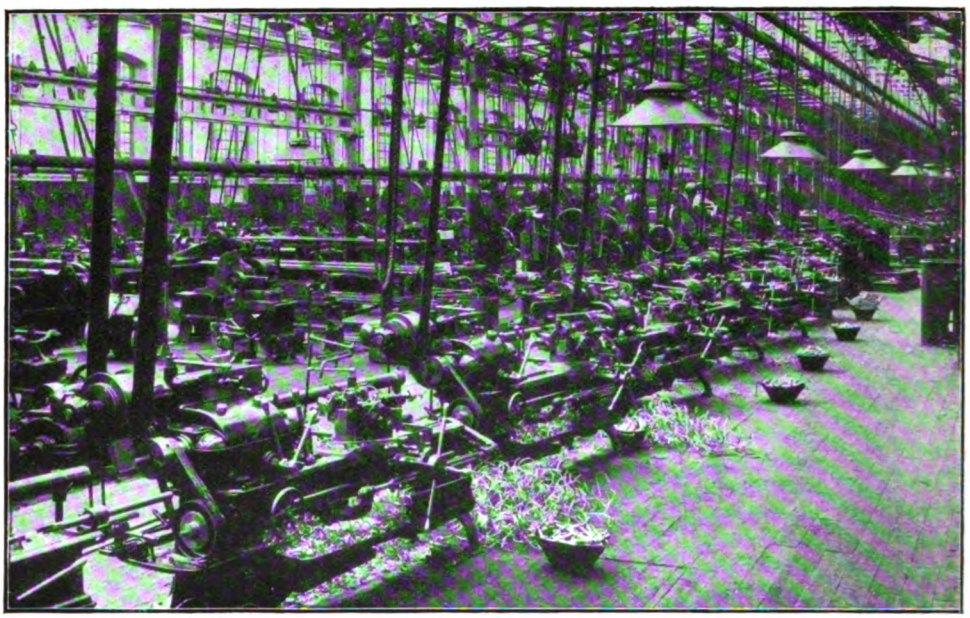
brass mounting and finishing, and a few tools. The section of the stores below is here devoted to brass for this department. Then comes a series of machines for wrought iron, including various types of lathes, etc., for dealing with heavy brake work, reversing shafts and spindles. I noticed also several automatic capstan lathes. A third section of this bay includes three cylinder boring machines, each adapted for dealing with two cylinders at once ; two single-cylinder boring machines ; and several heavy planing machines, single or double for cylinders, axle box guides, slide blocks and so on. Some of these machines are of interesting design and dimensions.

and other tools, and special automatic machines for grinding, sharpening and setting twist and other drills and tools. There is also a new bevel gear shaper and a milling machine. The template and gauge room adjoins, and in the next division is a tool hardening room in which are several gas-fired furnaces, fitted with pyrometers for indicating temperatures, for hardening and setting tools, with a small forge. Beyond is the grinding shop, containing machines of various types for grinding slide bars, body-grinding connecting and coupling rods, valve rods, etc., and a swinging grinder.

We now come to another two-bay machine shop, and this division is in many respects



ANOTHER VIEW IN THE MACHINE SHOP.
A group of capstan lathes in the foreground.

What is to all intents and purposes a fourth bay in the machine shop is divided into several divisions. In the brass fitting shop nearly all turning machines are of capstan type. There are also drills, a 4-spindle "sensitive" machine for drilling, facing and screwing brass castings of special form, and several grinding and polishing machines. The last mentioned are all fitted with an exhaust connection for withdrawing brass dust. In the corner is a small tool counter for this division.

The tool room adjacent is devoted entirely to the making, storage, repair, sharpening and issue of tools. There are several lathes

the most interesting in the works, as it contains so many milling, automatic and other special machines. One end of each of these bays is devoted to machining nuts, bolts, stays and indeed anything which can be made from metal bars. Among them may be noted a group of automatic machines, nut and bolt tapping and screwing machines, and other usual equipment.

Continuing along the first bay on one side is a remarkable group of no fewer than 12 automatic and 15 semi-automatic or hexagon turret lathes, diagonally arranged, and used for making special pins, boiler stays and similar parts. On the other side are various

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ordinary lathes, drills, slotters, planers, spring slotters and other tools. Further along is a sawing section, with hack saws, cold saws, a band saw and punching machines; while at the further end are several larger drills, radial and fixed, and a number of machines of usual types dealing with various classes of work of medium size.

The remaining bay is devoted largely to milling machines, a special feature at Derby. These machines are of all classes, with vertical, horizontal and duplex cutters, and including designs wherein the cutters are parallel, helical, double helical, wide and small-diameter, narrow and large-diameter, and of special forms. Among them may be specially noted a duplex machine for milling spring ends; a multiple machine for milling castellated nuts; horizontal and vertical millers for surface and side work; and a big horizontal mill. This bay also contains a series of marking-off tables for connecting rods and the like, several motor-driven high-speed planers, with various small divisions devoted to shop repairs, making metal patterns, copper stay work, bench work, and a belt store.

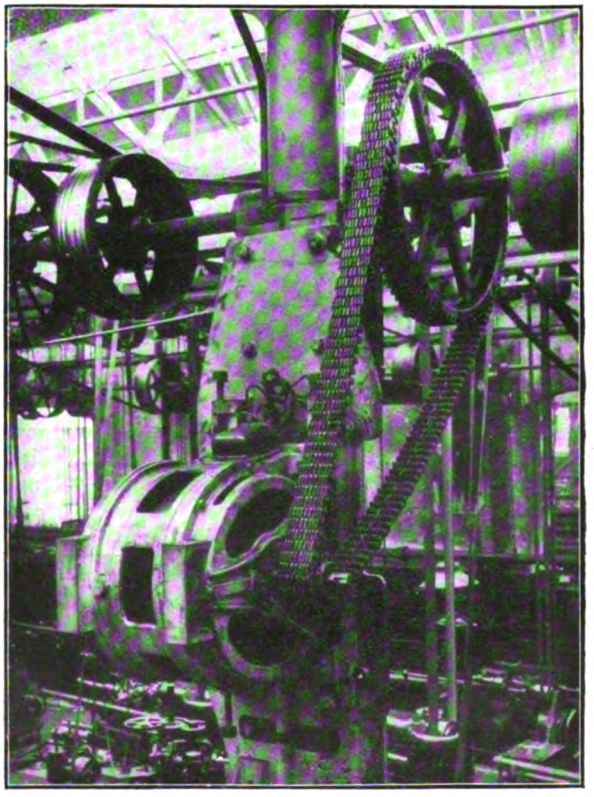
The paint shop is one huge department in two bays, well lighted, warmed, and with offices, paint stores, mixing machines and washing accommodation along one side. There are five roads and about 40 engines are accommodated simultaneously, allowing a usual proportion of tender and tank classes.

Remaining divisions are in more or less isolated buildings, and it will be convenient to deal with them as they call for attention, commencing again at the offices and following the canal bank, then visiting various shops beyond the main group of buildings, and returning *viâ* the tender shop and the round houses.

The various buildings in the angle between the station and the canal are nearly all devoted to the stores department, but the chemical laboratory calls for special consideration. At present the laboratory is accommodated in a somewhat inadequate building, but the old electric light station, on the town side of the railway station and beyond the limits of the plan, is being adapted to form a new and even better equipped laboratory to which Mr. Archbutt and staff will be transferred in due course. Here is a comprehensive chemical department, with physical testing appliances as required. There is also an oil tester, and a special machine for ascertaining the frictional resistance of oil, and for comparing the lubricating values of various qualities. This is provided with an elaborate system of gearing, operated from an electric motor, whereby an almost endless variety of speeds may be obtained.

Alongside is a fire-engine house, and it may be mentioned that the Midland Railway Company have recently appointed Mr. W. O. Etherden to the charge and oversight of the fire equipments at Derby works and all over the system. Mr. Etherden, for 32 years with the London Fire Brigade, has the distinction of being the only recipient of the King's Medal conferred for executive fire work this year. Throughout the works there is an efficient system of hydrants and fire brigades are constituted from among the men.

Near the canal is a series of three mess-rooms for the workmen. Here about 1,500



ELECTRIC MOTOR DRIVING SHOP SHAFTING BY MEANS OF MORSE CHAINS.

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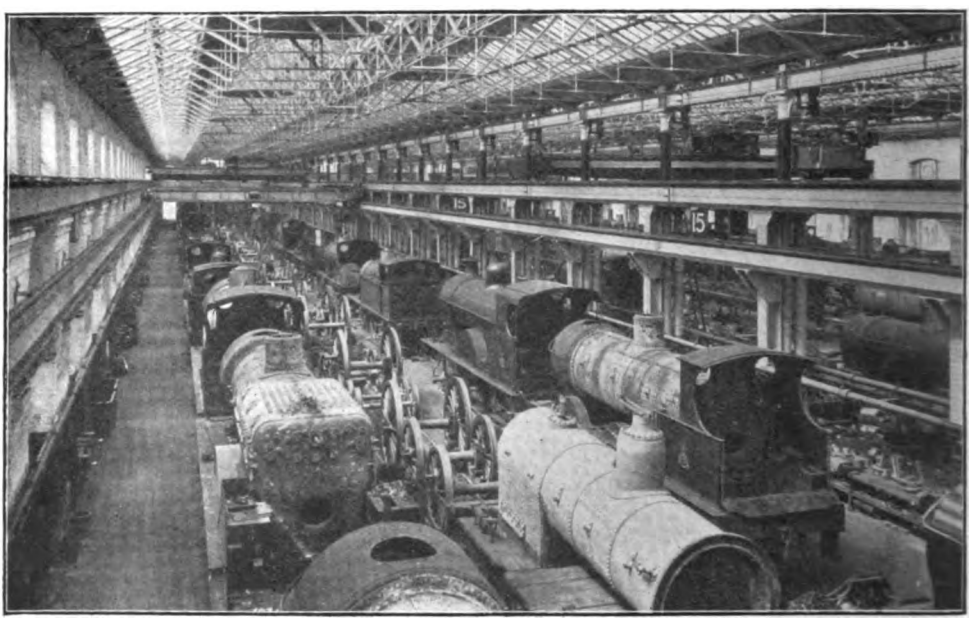
men can be accommodated for breakfast and dinner, an extensive system of hot plates and lockers being provided. Meals are not supplied, but the men leave their food with the attendants, and it is warmed up for them by the time required. The company provides the accommodation and the staff. An interesting scheme is adopted in classifying the three divisions. The men have full freedom of choice as to which they attach themselves, but are expected to keep to the one selected. In one of them local preachers and ministers attend during breakfast, giving a short address, concluding with a hymn and prayer. In the second no such provision is made, but smoking is not permitted. The third includes liberty to smoke as desired.

The smithy is located in a building about 450 feet long. There are 10 steam hammers, 4 of 10 cwt., 2 of 7 cwt. and 1 of 6 cwt., and 60 fires. One end is devoted to spring manufacture, with furnaces and knibbing and other machines. Outside is a machine for taking off spring buckles. The hammers are supplied with steam partly from boilers adjacent and partly from the power station. In the gasfitter's shop, lamps, tin-plate and other work is done. One of the electrically driven air compressors in the works is fitted here. Adjoining is a fire brick store.

At this stage it will be convenient to inspect the power station, though this serves the Carriage and Wagon, Signal and Telegraph Works, the station and offices of the company, as well as other departments, in addition to the locomotive works. This is a new building erected in 1910, and has replaced the old power station, which is to be utilised as the new chemical laboratory as already mentioned. It is located on the other side of the canal, being reached by a foot-bridge which also carries the conveyor for fuel.

On the works side, coal is dropped from hopper-bottom wagons into a hopper pit and is then lifted by a bucket elevator to a conveyor running across the footbridge, being fed downwards thence to the fuel bunkers. The elevator and conveyor have a capacity of about 15 tons per hour. The belt is 185 feet long and 18 inches wide. A 10-ton crab is carried on the bottom flanges of the bridge, and is used for removing ashes. The power station is in two divisions. In the boiler house are three Stirling boilers, each having 6,021 square feet of heating surface and grate area 109 square feet. They are of five drum design, and supply steam at 170 lbs. per square inch, superheated 150° by means of Foster superheaters. The boilers each have two "Underfeed" mechanical stokers arranged to burn low-grade coal. Each



IN THE ERECTING SHOP.

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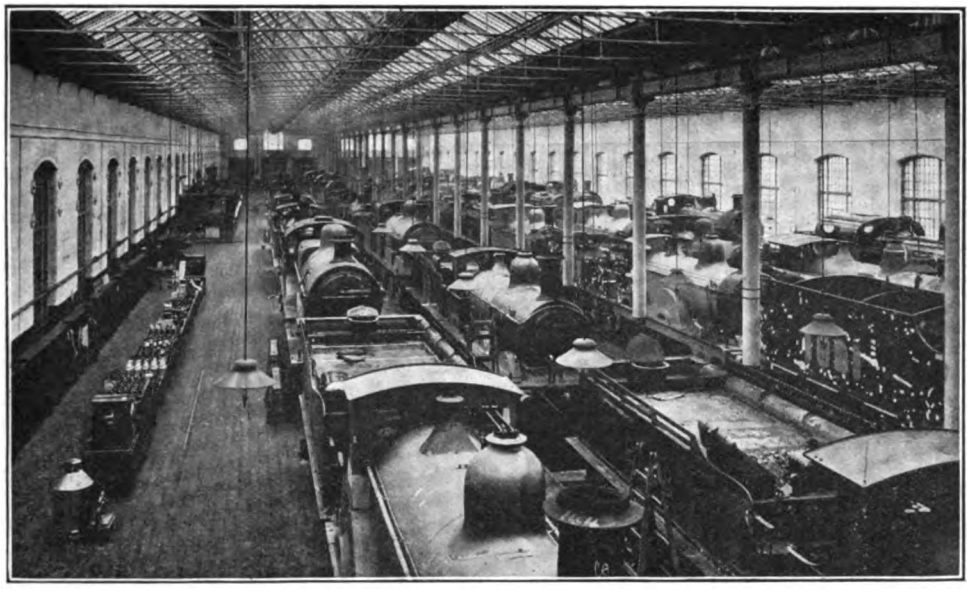
boiler is provided with motor driven draught ans.

The engine room is in two floors. Two old Willans engines direct-coupled to dynamos supply respectively 250 and 160 K.W. three-phase alternating current. They belong to earlier days, and are now retained merely as stand-byes or for meeting demands when very light. The main generating plant consists of two Parsons turbines, 1,250 K.W. each, running at 3,000 revolutions, and coupled to generators of revolving-field type. These supply three-phase alternating current, 50 cycles, 440 volts, direct to the locomotive works, the signal shops and the stores; but for the Carriage and Wagon Works current is stepped up to 6,600 volts by means of distance across the fields; a steam recorder for steam supplied to the smithy. A CO_2 recorder is installed in the boiler house.

In the basement are surface condensers for the turbines, fitted with air pumps and a vacuum augmentor; and a condenser for the old engines. Automatic valves enable the turbines to be put to atmosphere if required.

Returning to the works and proceeding to the further end of the boiler shop, an extensive yard may be noted, spanned by a gantry for a 25-ton overhead electric crane, and used for taking boilers to pieces and for general purposes. Along the wall are stands for steaming and testing boilers, while new boilers and superheater elements are hydraulically tested close by.



THE PAINT SHOP.

three transformers located in the basement, and transformed down to 440 volts at the other end. Exciters are direct coupled to the turbine shafts.

For lighting, a three-wire system, giving 100 volts at the lamps, is employed. The high-tension switchboard was erected by the railway company, as also the switchboard for the 150 K.W. rotary convertors installed for supplying cranes and other appliances with 440-volt direct current. Boosters are used for regulating the lighting voltage. Among the special appliances may be noted a V-notch recorder for water consumption, condensing water being obtained from the river Derwent, a short

Along the main avenue and in line with the brass foundry is the photographic department. This is attached to the drawing office. The equipment includes baths for blue and other printing processes, and dark room, an enlarging room, a continuous electric printing frame, copying appliances, and a bromide printing room. In one section the "true-to-scale" scale process is in use, this method giving results which approximate to the clearness of original drawings. Original drawings are as a rule kept in the drawing offices, but the tracings which form negatives for blue and other printing are all stored by the photographic department, copies being supplied as re-

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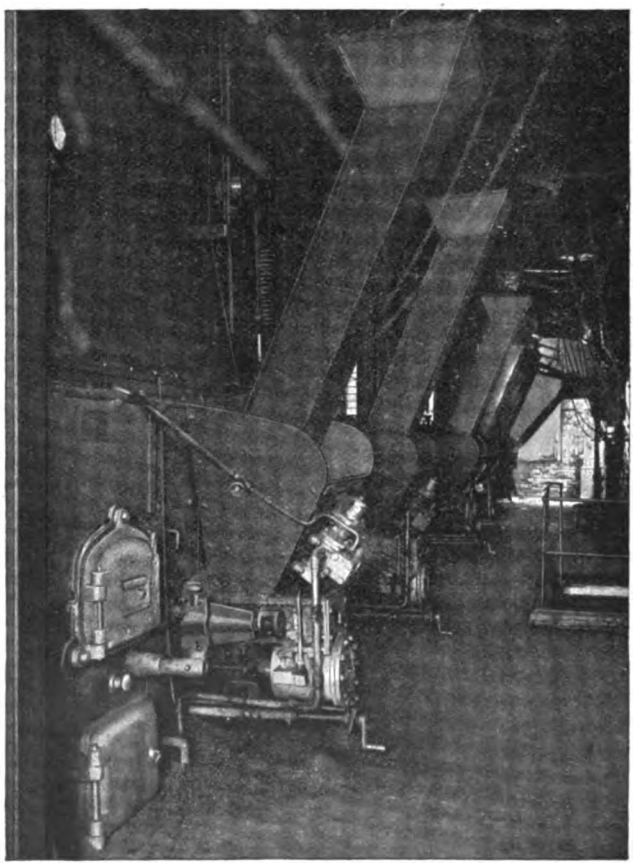
quired. This is an advantage from a fire standpoint. The staff includes several experienced photographers, as general work is also done for the company.

In the forge there is one 5-ton steam-hammer, and smaller hammers rated at 50 cwt., 30 cwt., 20 cwt., etc. Cranes are installed as required, and the large coal furnaces feeding the hammers are so arranged that the gases therefrom pass to steam boilers outside, which generate steam for the hammers. Beyond the division wall are two sets of electrically operated friction drive drop stamps, one consisting of one 30 cwt. and one 20 cwt. stamps, the other of similar type but with 10 and 7 cwt. stamps. Considerable use is made of drop stamping at Derby, including a number of special developments, such as the manufacture of slide valve buckles by a composite method. Near this building a selection of articles made in this way is displayed on a convenient wall.



UNDERFEED STOKER COMPANY'S CLASS "E" STOKER APPLIED TO RANGE OF STIRLING BOILERS IN THE MIDLAND RAILWAY ELECTRIC POWER STATION AT DERBY.

In the adjacent yard stacks of steel blooms, billets and the like are placed, and it is interesting to note that the ends are painted various colours—red, crimson, yellow, blue, green and so on. These colours enable the particular quality of steel to be at once identified, ensuring that no mistakes are made through lack of ability to distinguish the different grades in the rough.

The concentration yard is the receiving and distributing depôt for more valuable metals and is contained within an enclosing fence. The boiler-tube section is attached to this, a building within the enclosure containing tube-cutting and tube-stretching machines, with rattler outside. The principle is that tubes withdrawn from boilers are sent to the concentration yard and then re-issued with new tubes as required. Tubes for superheater elements are also distributed from here, as also metal plates and, in fact, general metal supplies, whether stored here or on convenient ground adjacent to the shops where they are used. Scrap metal is also attended to here, being collected from all departments and sorted and prepared for sale or melting up again. Apparatus is used here whereby iron is magnetically separated and cleared from brass, whitemetal and dust. The big iron yard along the canal bank is served by a 5-ton overhead Goliath crane.

Near the photographic department a series of bunkers for scrap metal may be noted, the difference in ground level enabling the contents to be loaded into wagons on the railway track behind. Then comes a pattern store, and the iron foundry is reached. Here machine moulding is largely practised, not only for axle boxes and usual details, but also for such large work as cylinders and wheels, besides chimneys and so on. A "Jolt-ramming" machine is used for preparing cylinder moulds. The building is served by hydraulic pillar cranes, and on one side are large core ovens. There are two cupolas of 5½ tons capacity, and about 140 tons of metal is used each week. Parallel with

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this building is the chair foundry. Repetition work is mainly done here, and about 300 tons of metal are usually turned out per week. Two cupolas supply metal, and there is a lift outside for conveying coke to the top.

The space beyond the erecting shops on the other side of the main avenue, is largely given over to engine lines and general purposes, with an 8-ton overhead crane for lifting engines, and here and there small erections, one covering annealing furnaces, another a large boiling "bosh" or "boil." Further to the south is the main running shed—a big rectangular building with two

A sheerlegs provides lifting power for shed repairs.

The pattern shop is also characterised by the fact that the benches are arranged diagonally. It is an airy shop with a few tools, lathes, band-saw, a "universal" wood worker, etc., but is undergoing rearrangement, respective tools with additions being grouped more conveniently and on a system which will allow power to be divided, so that each section can be used or not as required, instead of having to run all the shafting.

The old round-house adjacent to the lagging shop is now used as a stripping shed

THE SMITHY.

sets of radiating lines, each served by a turntable, the round-house principle being generally favoured on the Midland Railway—with lavatories and bath rooms for engine men, and usual offices and stores. The coal stage is some distance beyond. On the station side of the shed is at present an open area somewhat tastefully laid out.

Along the north-western wall of the big machine and erecting shop building may be noted an Archbutt-Deeley water-softening plant. The old round-house adjacent is still used as such, amplifying the accommodation of the newer building above referred to.

for engines. Here details and fittings are removed from engines, being eventually reassembled in the erecting shop. In the lagging shop lagging is prepared for boilers, and cab and splasher work and smokebox doors are also dealt with here. The adjoining tender shop, as also the new tender shop along the main avenue, deal with tender erection and repairs. Outside the latter is a "Bosh" or "boil" for cleaning tender details.

Finally, alongside the stripping shed, and in the section marked "offices" on the plan, may be noted the foreman's mess room. Here is a kitchen and a dining room for the

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use of the foremen in the works, with a general room adjoining. In addition to its ordinary purposes, meetings are held here in connection with the ordinary carrying out of work, and also special meetings to discuss workshop methods, and subjects of practical and technical interest, Mr. Fowler and various chief officers frequently attending or speaking at such meetings.

Throughout the works there is, of course, a comprehensive system of standard gauge tracks, with turntables for cross-connections as required. For shop shunting small four-wheeled tank engines are used. These are similar to those used in certain goods yards about the system, but fitted with an auto-

THE IRON FOUNDRY.

matic bell-operating mechanism, to give warning of their approach. Narrow gauge tracks are also laid as required, but no locomotives are used therefor. For light delivery purposes a small 1-ton electric trolley capable of running 30 miles on one charge is used.

All the shops are well lighted, with incandescent gas in many cases, but electric lighting is becoming more and more general. Steam heating is provided as required and special ventilation apparatus is installed where called for. As a rule the shops are high, with good natural light. The usual system of recording time is by means of time recorders placed in the respective shops. Many of these are of the "Dey" type, adapted for recording time on work for special purposes, as well as hours of labour.

In conclusion, brief reference may be made to the Midland Railway Institute at Derby and social and other matters associated therewith. The building, opposite the station on the town side, is a handsome erection in red brick, well-equipped to meet all requirements. It has been provided through the generosity of the directors for the use of every grade of the company's staff, and its affairs are conducted by a council consisting of gentlemen occupying responsible positions in various departments, the Chairman of the Company, Mr. G. Murray Smith, being "President," the Directors "Patrons," and the chief officers of the Company, Vice-Presidents. Mr. George J. Pratt, has for many years officiated as Honorary Secretary.

In the library there are over 16,600 educational, historical and musical works, and books of travel and adventure, as well as general fiction. All the best new books are added immediately they are issued, and the library is kept thoroughly up-to-date in every branch. Each member is allowed one book at a time; he can exchange it as often as he pleases, or retain it for a fortnight or longer if he so desires, and the librarian is always willing to assist members in their

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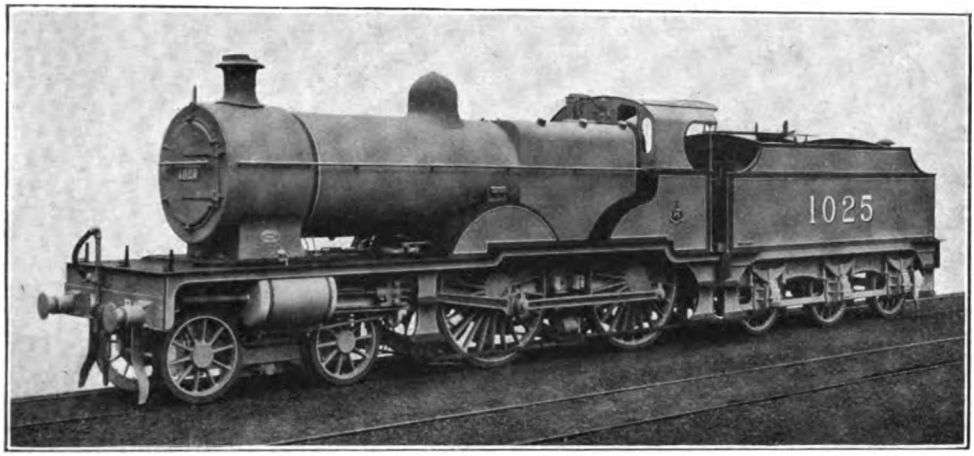


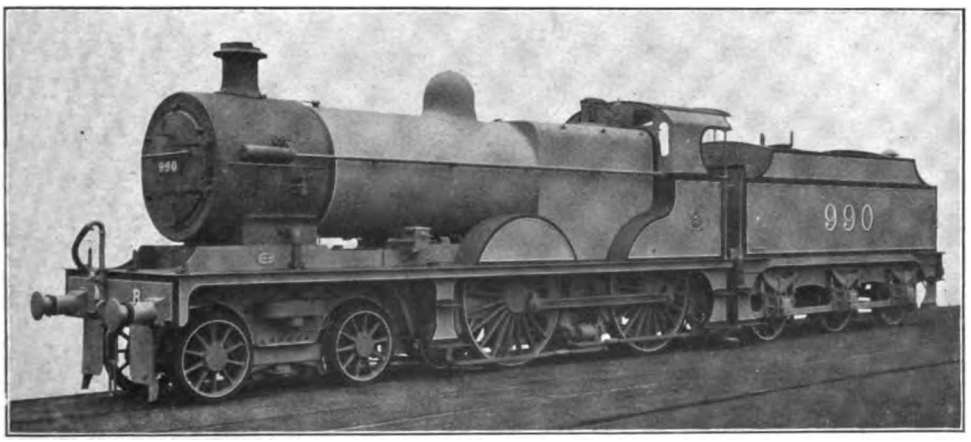
THREE-CYLINDER COMPOUND LOCOMOTIVE.

choice of suitable works. There is also a reference library, which includes many rare and expensive books, and these may be consulted by members at any time.

The reading room is large, brilliantly lighted, well heated and comfortably furnished. All the principal daily papers are taken in, and there are upwards of 50 illustrated and other weekly papers and 50 monthly magazines. Adjoining this room are the General and Chess Rooms. Smoking is permitted here. Upstairs there is a splendidly upholstered and equipped billiard room, containing three up-to-date tables, the charge for which is extremely moderate. Comfortable lounges are provided for watching games.

In connection with, and open to the members of, the Institute, there are numerous clubs, amongst which may be mentioned the Natural History Society. Engineering Club, Dramatic Society, Whist and Billiard Club, Chess Club, Fishing Club. and Photographic Society. Classes for the study of shorthand, French, and Spanish have been formed. The membership fee of the Institute is 1s. 1d. per quarter.

Concerts and popular lectures, as well as technical meetings such as those of the Midland Railway Engineering Club, are held either in the hall of the Institute, which seats about 500, or in other rooms according to requirements. The Dining Club is conducted on an elaborate scale, the dining room being a large apartment where meals are supplied substantially at cost price on a scale corresponding to that of a first-class restaurant. Here members of the salaried



LARGE 4-4-0 ENGINE (999 CLASS) FITTED WITH SCHMIDT SUPERHEATER.

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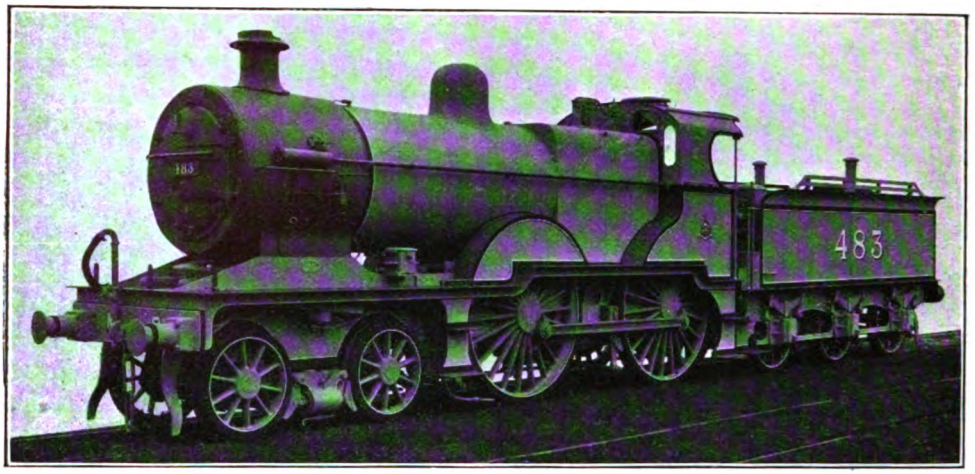
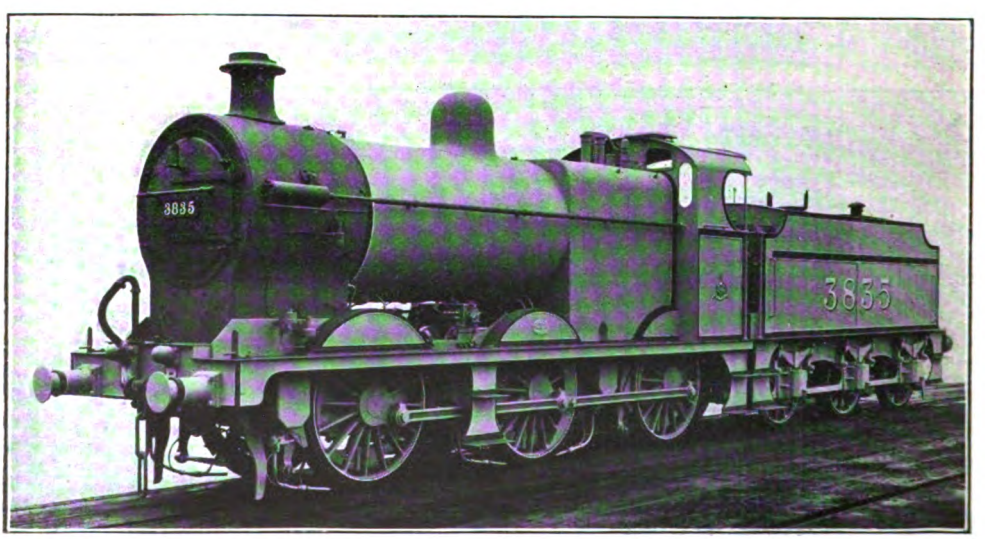


REBUILT 4-4-0 LOCOMOTIVE FITTED WITH SCHMIDT SUPERHEATER.

staff of all grades are provided for. On the ground floor there is a café, in two sections, one for workmen and the other for clerks and others who require only light refreshments and therefore do not desire to use the dining room. In connection with the Institute such matters as continental and other special excursions are arranged during the summer. In fact, the Institute is the centre of the whole of the social life of the Midland Railway at Derby. Mention may also be made of the annual grand concert held in February in aid of the Railway Servants' Orphanage at Derby. This is held at the Royal Drill Hall, and is well supported by Midland officers, being, in fact, one of the special functions associating the railway company with the social life of the town.

Mr. Henry Fowler, Chief Mechanical Engineer of the Midland Railway Company, received his technical education at Mason's Science College, now the University of Birmingham, at which University he is at present the President of the Engineering Society. He subsequently served his apprenticeship on the Lancashire and Yorkshire Railway, becoming successively Assistant and Chief of the Testing Department. He was afterwards appointed Gas Engineer, leaving the Lancashire and Yorkshire



LARGE GOODS ENGINE FITTED WITH SCHMIDT SUPERHEATER.

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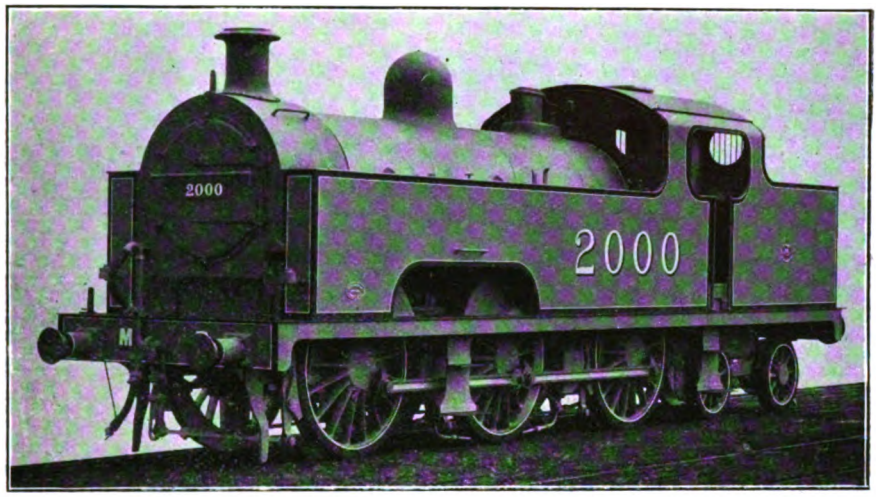

0-6-4 PASSENGER TANK ENGINE.

Company in 1900 to takeup a similar position on the Midland Railway. Whilst at Horwich he was associated with the Railway Mechanics' Institute, first as a student and afterwards as teacher, gaining the first Whitworth Exhibition awarded to a member of that Institute. He still evinces great interest in the technical education of apprentices. In 1905 Mr. Fowler was appointed Assistant Works Manager at Derby, becoming Works Manager in 1907. He belongs to the Institutions of Civil and Mechanical Engineers, and has read papers before both bodies, the former having awarded him a Miller's Prize and a Telford Premium for his contributions. It will be remembered he has recently read a paper on Superheating at the Institution of Civil Engineers. He was, with Mr. L. Archbutt, a reporter at the International Railway Congress of 1910, at Berne, the subject dealt with being "Improvements in Locomotive Boilers." For the coming Congress at Berlin, in 1915, he has also been selected to present a note on "Liquid Fuel for Locomotives." In 1913 Mr. Fowler was President of the Institution of Locomotive Engineers, and was recently appointed Hon. Secretary of the Association of Railway Locomotive Engineers. He was appointed to his present position in 1909, on the retirement of Mr. R. M. Deeley.

In conclusion, the writer may express his acknowledgement of Mr. Fowler's courtesy in arranging for his visit, for assistance rendered by various other gentlemen whom he had the privilege of meeting on that occasion, and of the valuable services as guide and conductor rendered by Mr. J. Clayton, then Assistant to the Chief Draughtsman in the locomotive drawing office, and by Mr. C. H. Jones, Works Inspector, in reference to the mechanical equipment of the works and associated matters.

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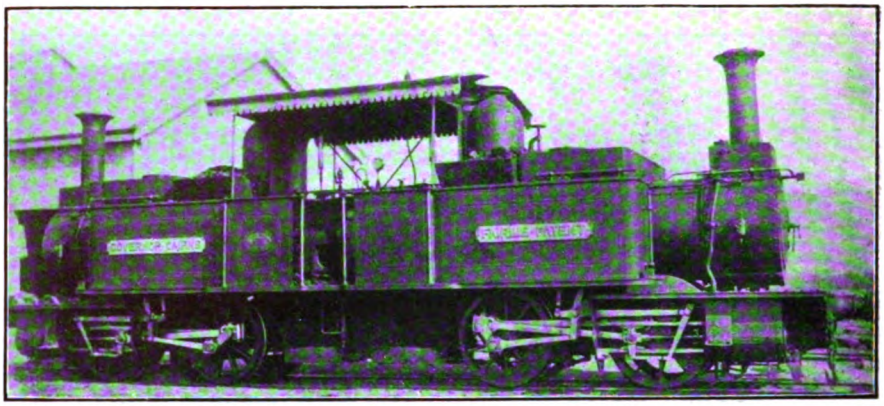

FAIRLIE LOCOMOTIVE: QUEENSLAND GOVERNMENT RAILWAY.

Leaves from the Log of a Locomotive Engineer [No. XIX.].

By ROBERT WEATHERBURN.

SUCH was one of scores of objections I made with more or less success. With narrow gauge engines, more than all others, I contended that the tender hand brake, fire door and damper levers, and as many of the armature handles as possible on the firebox front plate, should be so placed as to be within reach of the driver without withdrawing his attention from the cab window, as this type of engine would be often left for a short time with only one man on the footplate. The arrangement was just the opposite, every lever and handle was so disposed as if for the purpose of distracting attention from signals and road. Important bolts, placed in a vertical position, for securing the bogies were fixed head downwards so that in the event of nuts coming off they fell out. Motion pins were not properly secured, and, if loose, were liable to foul other parts, but why further instance details that any running shed tyro would have been able to see through.

The position of Widmark was most trying, and although agreeing with my objections, he steered his way diplomatically so as to avoid difficulty with the firm and Fairlie & Co. The next time I visited the firm after the boiler episode I met the redoubtable Robert Fairlie. It interested me to see the man who had designed the Festiniog Line, and who had succeeded in impressing the Duke of Devonshire, and, through him, His Excellency Count Robert Bobrinsky, Minister of Russian Railways, and many others in favour of the narrow gauge Fairlie system. Though not the first to advocate the use of light railways, he was certainly the most successful, and in its advocacy displayed considerable plausibility and ingenuity in dealing with the problem of first costs, a question of initial importance in undeveloped countries like Queensland was at that period. Time has proved how great a mistake the Queensland Government made in taking his advice for they are now unable to link up, without transfer, with the broad gauge of their neighbours.

I exchanged the chemical exhalations of St. Peters', Bristol, for the balmy atmosphere of Burton, fragrant of malt and hops, and was again on the pay list of the Midland Railway. After a short time I was sent to the firm of R. Stephenson & Sons, South Street, Newcastle-on-Tyne to inspect new locomotives being built to the order of the Midland Railway and designed by Mr. S. W. Johnson. As Mecca is to the Mahometans, so should Newcastle be to every railway man, at least so it was to me. Void of false sentiment, but with an interest akin to reverence, I entered the unassuming portals of that historic establishment, and was more than surprised to find that the Managing Director was no other than Mr. G. Douglas, the former locomotive engineer for the now defunct Birkenhead and Chester Junction Railway.

Whilst making a tour of the works I was

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MR. GEORGE ARTHUR CROW.

Late Works' Manager, Messrs Robert Stephenson and Co., at South Street, Newcastle-on-Tyne.

introduced to one of the most striking personalities of the North, whose name was known and respected by all who had the pleasure of meeting him professionally—Mr. George Crow (or "Geordie Crow" as he was generally called) the works manager. He was then a man over sixty years old, but the gleam of his eye and the boundless energy displayed in every movement of his expressive face and figure would have shamed half the young men of the country. To those who like a "character face" he was a perfect study. High wrinkled forehead crowned with iron grey hair that resented all discipline, eyes one moment soft and eloquent to tenderness and the next glittering with excitement or anger; a nose, nowhere to be found in such perfection as in the North; and there only on the face of men of ability. But the beard! not long enough to be patriarchal, but ample in length for him to grasp and tug at when his excitable temper had been aroused, or gently stroked or held fast when interested, pleased, or eventually solving some difficulty. He was at that time, and for years, the most redoubtable mechanic in the north, and such men, once met, register an impression that never fades.

Responsible, at a time of cutting prices, or the success of works more than half a century old, and destitute of modern machinery, and railway communication, and having to compete with firms equipped with the latest labour-saving tools and machinery, and so planned as to give the most rapid transit incoming and outgoing; yet with this enormous discrepancy—handicap, if you will—the firm undertook to build and deliver locomotives to the satisfaction of the Midland Railway Company. Everywhere decrepit old lathes, slotting, and drilling machines that no other firm would have harboured, and few would have speculated in except for scrap; yet no finer work ever left a firm than was turned out through the care, aptitude and genius of Geordie Crow. Equally at home with marine engines and locomotives, he had successfully developed the type of marine engine used by Mr. Alfred Holt, the well-known Liverpool shipowner and engineer, and indeed was the first to suggest to Messrs. Randolph and Elder through their draughtsmen, Mr. Snowball, the advantage of compounding marine engines.

The firm of R. Stephenson & Sons, had abstained from building locomotives for a number of years to within a comparatively short time previous to securing the order of the Midland Railway, and had dealt almost exclusively with marine work. With a history and reputation such as they enjoyed, such action appeared inexplicable; but, after so long an abstention, to re-enter the lists without previously restocking their old-fashioned workshops with up-to-date machinery was still more extraordinary. Day by day, as I made myself familiar with the ins, and outs, of the curiously built old place, with its rickety and ill-adapted machinery, I wondered how they would deal satisfactorily with the stipulations of our contract; more especially as the price at which it was secured was very low. But my wonder was greater when I saw how infinitely resourceful Mr. Crow was. The old main shafting was soon geared up to a maximum speed; counter-shafts steadied; heavy machines that were already groaning under the stress of speeds they were not intended for were stayed, strengthened and further accelerated; large planing and slotting machines were soon working to the verge of breaking; others were more ingeniously altered to meet the new requirements; and the old factory in sound and bustle wore an air of rejuvenation. "I cannot get new machinery, so I must make the old toe the line, Weatherburn; and

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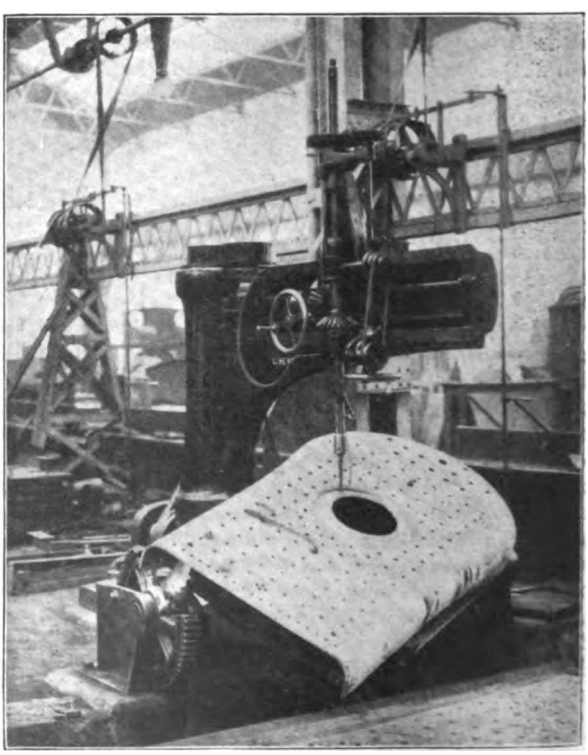
they shall do it if I pull the roof down," said Crow; and he did it.

Quicker speed, and heavier cuts at times produced disaster and stoppage for a brief period, but the old veteran, full to the brim of resource and expedients, soon put them right. The most passionate of men for the moment, yet forgetful the next, it was no uncommon thing to see him, when some blunder or mistake had been made, fling down the drawings which he held in his hand and, when not so encumbered, his hat, and pulling at his beard vehemently denounce the delinquent in the broadest burr to be heard.

I remember gauging some newly bored cylinders and finding them perceptibly smaller at one end than the other. He was passing by at full speed at the time, when I stopped him and complained. In a moment he seized the mets, and dropping on his knees gauged each end. "By God, Sir, do you expect anything better than that, not $\frac{1}{128}$ of an inch out; what do you want? What do you expect better than that? Look at the d——d old machines, Sir; forty years old if a day; besides the cutter will wear down that much from end to end." I simply answered I had nothing to do with the boring machines or cutters, but I must insist on having the cylinders right. "Then just make them right yourself and be d——d to you," and picking up his roll of drawings he hurried away. I happened to run against him after dinner when he stopped me just as if nothing had happened, and explained that it was Friday and that he had enjoyed his favourite dinner that day—"Mountain Cropper"—and in the next breath apologised for having lost his temper, trusting that I would overlook it and he would have the machines overhauled. It was needless; I had already discounted his vehemence to the full, knowing how much responsibility he carried. Besides this phase of his character was well known to me, as Mr. John Blair of the Danish States Railway, a great admirer of Crow, had years previously spoken of him as having the most fiery temper, and the best head and heart of any man he had met with.

Such men wear out, but never grow old. His enthusiasm and delight over each achievement, and particularly when watching the action, or new movement, of one of his ancient and once sedate machines converted by him to fulfil the duty of a modern one was, for a moment, that of a boy; quickly chastened by the remark, "A new machine would have cost so much, and I can't have the money; now that has cost one tenth of the sum," and then away to other duties. The works abounded in evidences of his ingenuity and inventive power. Everywhere his hand and brain had been at work. The old veteran of a shop engine among other things, was fitted with a curved expansion link, controlled by the governors, which directly proportioned the travel of valves to the work done. This although an ancient institution there; was years afterwards patented in the identical form by a celebrated firm of engineers. I requested that the rims of the W. I. wheels of the locomotives should be radially shaped (slotted) so as to give a uniform thickness. In less than a week he had designed and made a curvilinear machine which did the



CROW'S "UNIVERSAL" TABLE APPLIED TO VERTICAL DRILL, SHOWING FEATURES OF APPLICATION.

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work splendidly, and was moreover a model of neatness. His patent universal angle drilling machine suitable for any angle, and invaluable for boiler work, along with his reversing lathe are but isolated examples taken at random from a ruck of others. But his " forte " was his power of adapting old worn out or discarded machines to new duties.

I recall his look when surveying the first two engines finished, previous to their being sent away. The thin, nervous, bony hand repeatedly stroking his white beard eloquently expressing his satisfaction. Had the scope and area of his work been greater, these few lines would not have been needed. Many years have elapsed since then, and I have known many men come and go with great public recognition; yet for general ability, untiring energy, and resourceful ingenuity, I have never met his equal. It may be considered somewhat out of place and even presumptuous to remark that during my time at Stephenson's I always felt as though I was witnessing a last desperate effort against overwhelming odds—nay, the inevitable, made by one gallant man almost unaided—to regain that which should never have been lost. The works and offices were full of strange memories. The old drawings and models, over which the Stephensons, father and son, had bent, and debated in those days when Chat Moss was a death trap, and the Menai Straits unbridged. Little hand sketches made by young Robert, trifles in themselves, but which in their day served their purpose, and became embodied in designs which carried their fame to all parts of the world. What a magnificent store of railway history and enterprise they represented! And how neglected. Why the Athenians would have surrounded it with a stately parthenon and Phidias would have embellished it. The Romans would have honoured him by a column higher than that of Trayan and given him the title of Pontifex Maximus. Why this neglect? Is it because the prophet as usual lacks appreciation by his countrymen? It cannot be that one invention trod so close to the heels of its predecessor as to minimise the work of the stern fronted Northumbrian and his classic headed son.

The United States, Germany, or even France, with so replete a storehouse of past talent, talent which had revolutionised the world, would have consecrated the building to future generations, and made it an object of national exultation and pride.

All retainers of decaying houses are interesting, and carry about with them an air of respectability unassociated with the more modern and prosperous. Perhaps they feel more sensitive; and certainly, with the premature death of the talented son of the founder of the business, they recognised that the glory and strength of the house had departed. Mr. Budden, the head of the commercial department, had the air of an ancient banker who had seen better days. The ever courteous and gentlemanly Mr. Proudlock was always ready to champion the firm's lost cause. Mr. Kitching, chief draughtsman full of work and worry, had unconsciously acquired the demeanour of a man engaged in a hopeless task. " Hope deferred maketh the heart sick! " When called away I felt an unbounded sympathy with the gallant old fighter and the loyal gentlemen I left behind.

On my return to Derby Mr. Johnson instructed me to proceed to Liverpool, and, until further notice, take up the duties of District Loco.-Superintendent there. From the banks of the narrow unimposing Tyne, to those of the Mersey, with its gigantic granite-built docks, forests of masts, and huge warehouses, was no ordinary change. My headquarters were at the Brunswick Dock, the sheds being in joint occupation of the Manchester, Sheffield, Lincolnshire and Midland Railways. A joint occupation is always disagreeable arrangement, and I soon realised that owing to the greater number of engines stationed there by the Manchester, Sheffield & Lincolnshire, which did the work of the Cheshire Lines Committee, the officials of that Company looked upon it as giving them a senior position, or prior claim. This, unfortunately, had been tacitly conceded by my predecessor, Mr. Homer, a quiet, good-natured man. Results had been somewhat disastrous, as the systems of discipline of the companies were as different as possible. The Manchester, Sheffield & Lincolnshire Railway Co.'s engineer Mr. C. Sacre, though an able man, was the embodiment of good fellowship, much appreciated by his staff, but unfortunately taken advantage of.

Not without dignity, when officiation required it, he nevertheless treated his staff and drivers with a brusque comradeship that made him intensely popular, but which unfortunately did not promote the interest of the Company; every express driver was known to him by name. Indiscriminate smoking was allowed on the footplates, and

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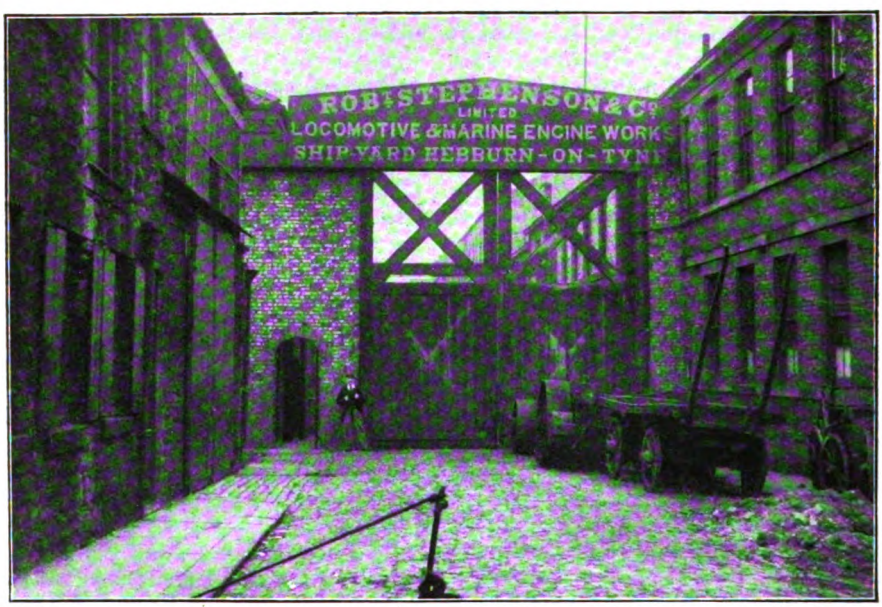
it was no uncommon thing for Mr. Sacre in his bluff and hearty way, when passing by an engine, to hale the driver; "Dick, let me have a pipe of your tobacco." "How are you getting on old fellow?" or when reprimanding him for some breach of rules or neglect of duty to almost condone the offence by the familiar colloquialisms he employed. Fines and punishment were unknown except for the most flagrant of offences. Brusque, but kind and genial by nature, his kindness was taken advantage of and abused, and led to a lack of order and discipline in many, both in personal habits and work, that was in marked contrast to the high-toned discipline everywhere to be found on the Midland Railway, and which was happily productive of the best results—self-respect and respect for others. Yet the joint occupation brought the employés of both systems under one common roof or housing.

The Manchester, Sheffield & Lincolnshire men openly exulted in the immunity they enjoyed, and too often flouted the Midland men on their less favoured condition. This often led to horseplay in its worst forms and unseemly jealousy. In justice to the officials of that Company it must be said that they did all in their power to deprecate it. Oil and water will not mix; the disciplined men of one Company as a rule, though not avowing it, considered themselves the better, whilst those of the other Company felt contempt and dislike for the system which produced results so different from their own. I write this in no unfriendly criticism, but describe the position just as it was thirty years ago, and doubtless there are hundreds who still remember that such was the case.

Much of the high state of discipline on the Midland Railway at that time was due to the well-known divisional superintendents of the North and South, Messrs. Jones & Adams. I believe I am right in saying that Mr. C. Markham, formerly assistant to Mr. M. Kirtley, and later the head of the Staveley Iron and Coal Company, and father to the present member for Chesterfield, was one of the first to lay the foundation of that system of discipline which, years after, Messrs. Jones & Adams developed with so much credit to the Company and themselves. It is strange, but one of the finest tributes I ever heard was from the lips of the chief mechanical engineer of the premier line of England, who remarked, when speaking of the Midland Railway, that their "splendid discipline and pride of place were largely, if not entirely due to Messrs. Jones & Adams." They were justly styled the drill-masters of the Midland Railway. And their example was,



MAIN ENTRANCE TO ROBERT STEPHENSON AND CO'S OLD LOCOMOTIVE AND MARINE WORKS AT SOUTH STREET, NEWCASTLE-ON-TYNE.

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without loss of prestige, copied by many officials of other Companies.

Very few Railway Companies, at least in this country, have been favoured with more able and far-seeing directors than the Midland Railway. Every large city or town through which the Midland Railway runs is supposed to be represented by a director.

The gentleman who represented Liverpool at the time of which I am writing was a Mr. Cropper of the "Dingles," I believe a nephew of the great writer and historian "Thomas Babbington Macauley." Whatever his genealogy or profession, he was, at least, a man largely endowed with those qualities necessary for that position, and

MR. C. H. JONES.
Late Assistant Locomotive Superintendent, Southern Division, Midland Railway.

MR. W. H. ADAMS.
Late Assistant Locomotive Superintendent, Northern Division, Midland Railway.

from the date of his appointment he sedulously strove in every way to uphold and advance the reputation of the Company. As a member of the locomotive committee he took more than ordinary interest in everything pertaining to that department. I soon realised that he looked upon our depôt at Brunswick as being under his special notice: hence he was a frequent visitor at the most unlikely hours. He was a man of high moral character, a strong advocate of temperance and, privately very charitable. In my busy moments I often found him unexpectedly at my elbow, and his pertinent enquiries as to this, or that, on hand showed his desire to become familiar with the smallest details of railway working. Although annoying at times, it was generally a genuine pleasure to give him the information required. Unfortunately he had the habit of canvassing the opinion of subordinates, and thus primed would occasionally suggest some utterly unworkable alternative. On one occasion I had made an arrangement which did not exactly suit one of my express drivers, who instead of consulting me, put himself in the way of Mr. Cropper and submitted to him a proposition of his own, which, on the face of it, was very plausible.

Just at a busy and inopportune moment, charged with the new suggestion, he presented himself, and after the ordinary salutations said "I have been having a long talk with driver —— and he suggests that such a working should be adopted," which he proceeded to explain. I listened very attentively to the end, and then remarked that it would be better if he more thoroughly understood the workings. Possessed of considerable penetration and business aptitude, he soon realised that the proposition would entail greater expense, and be less satisfactory to the other men,

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and wished to say no more, but that did not suit me. I then put the question to him whether he thought such open canvassing of the opinions of subordinates compatible with my position and the discipline of the Midland Railway, which always exacts that any complaint or suggestion, should be promoted through their immediate chief. After a moment's reflection he remarked, "Mr. Weatherburn, I am much obliged for the lesson. I promise you that this will be the last time I make such a mistake." The incident may appear trivial, but the relation of so gentlemanly an acknowledgment is a pleasure I cannot forego. The driver in question, a smart fellow, and one whom I, years afterwards, caused to be promoted, was decidedly in error in that and other things known to me.

Another instance showing the good side rarely presented to the public by Mr. Cropper. He had an earnest desire to counteract the temptations of public houses, concert halls, and other amusements which abounded, but above all to elevate the intellectual status of the men. With this object he presented the depôt with a small library of choice books principally of his own selection, and further expressed a desire, should they show appreciation, to provide a course of lectures on subjects that should be of interest. I regret to say that the gift was only appreciated for a short time, and the course of lectures was soon dropped for want of an audience.

About this time (1880) the colour of the Midland engines, which had been hitherto painted a light green, was assimilated to that of the carriages, now a rich lake, thus imparting a pleasing uniformity, and having the additional advantage of not showing change of colour and being cheaper. On the occasion of the annual visit of the directors I had provided an engine painted with lake, and when asked my opinion by the committee I expressed my approval of the change, as being in every way an advantage. To my surprise, and somewhat to the consternation of the committee who had passed the minute, the driver standing by said that the change was detrimental to the men's eyesight, and that several of his mates had already complained of its ill-effects, and that green was a natural resting colour for the eye when wearied. However, knowing the driver to be one of the irrepressible order, I assured them that no complaint had been made, or was likely to be made.

However this led to inquiries of an extensive kind being made for some time, thus showing how, in small things, the interest of the men on the footplate are considered, the eyesight question being always to the fore, and coming constantly under the survey of responsible officials. The following incident, one of several which occurred in a lengthy experience, is interesting as showing how the professional oculist and the officials treat the question. After an accident of a nerve trying character, or a severe illness likely to affect the eyes, it becomes part of the duty of the local head of the depôt to test the eyesight. One of my firemen who had been laid up some time with something which affected the head, on reporting himself ready for duty was examined in due form, but was unable to count the dots with one eye. I advised him to consult an oculist. He returned in a couple of hours, and produced a paper from one of the city eye hospitals stating that his eyes were in good condition, and with the gratuitous advice that in such matters I had no right to give an opinion; I then asked the man whether he was agreeable to be tested then, or would he prefer another day? On the following day he again presented himself, and with one eye closed at half the regulation distance made the most alarming mistakes. I allowed him to count the numbers with both eyes afterwards to convince him. It was providential to him, as it had been to many others, to make this discovery in time, as it was a kind of myopia which, if neglected, leads to partial loss of sight, and a few days rest and professional treatment put him right.

(*To be continued*).

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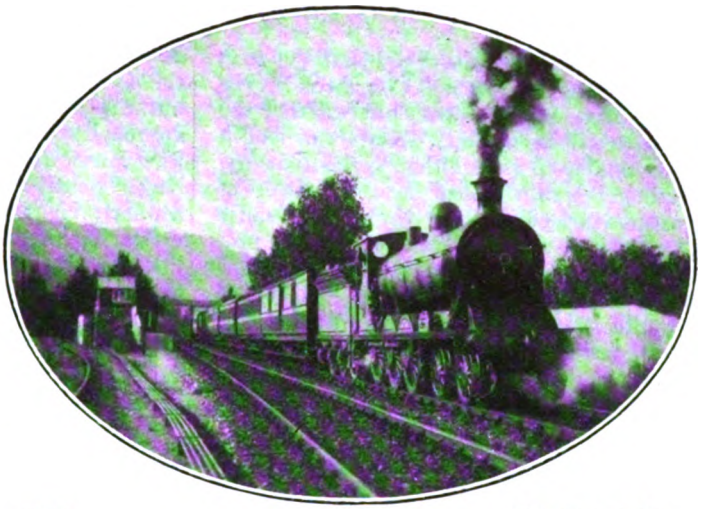
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*Tom M. L. Neish.*

CALEDONIAN RAILWAY.

12.35 p.m. Oban-Glasgow train leaving Crianlarich; 4-6-0 locomotive No. 52.

IN continuation of the series of articles descriptive of modern British superheater engines, commenced in last month's issue, tables are given herewith showing details of the boiler heating surface and fire-grate area of the 45 locomotive types under review. So far as performance goes, the steam-producing powers of a locomotive boiler may have but little influence on the work done on the road: indeed, as will be seen later in the present issue, it is often possible to secure quite contradictory evidence on this point, engines of small-boilered and early types by the brilliance of their efforts at times leaving the modern behemoths entirely in the shade. One can never tell, however, how much of this variation is due to variation in driving, and whether or no the small engine is being thrashed to secure these results. These uncertainties, however, are more than counterbalanced by a certainty of evidence in the other direction. There is no possible doubt that many advantages rest with the large-boilered engine; in the modern boiler and firebox, if the design be satisfactory, there is a reasonable probability of the fuel being thoroughly consumed, and of a maximum of its calorific value being utilised before the waste gases are thrown out of the chimney. Moreover, there is always an ample head of steam to meet emergencies of load and weather. It is an open secret on more than one line that modern large-boilered locomotive types are doing the work of their smaller predecessors—and doing it very much more satisfactorily, too—on a smaller coal consumption. There are always factors of expense to consider in connection with these large locomotives, as, for instance, constructional costs and maintenance of way, and in many directions these are being met by the construction of large-boilered 4–4–0 engines, which are quite the feature of present-day design, but, generally speaking, the big modern locomotive renders possible substantial economies in working, which are still more accentuated in the use of the principle of superheating.

In the matter of heating surface the famous Great Western Railway 4–6–2 engine, No. 111, *The Great Bear*, still stands in a position of lonely glory with 3,401 sq. ft., although the boilers of certain modern mammoths furnish a total that comes within measureable distance of this large figure. For instance, the two Great Central Railway 4–6–0 superheater types, No. 423, *Sir Sam Fay*, and No. 4, *Glenalmond*, each have a total heating surface of 2,817 sq. ft., the boilers of these two classes exceeding the length normal to the 4–6–0 wheel arrangement in that the centre-line of the smoke-box is ahead of the centre-line of the bogie. Curiously enough, in the case of another large modern 4–6–0 type—the London and North Western No. 2222, *Sir Gilbert Claughton*—exactly the reverse is the case, the smoke-box centre-line being in the rear of that of the leading bogie, but it must be mentioned that the wheelbase of this engine is greater than that of the two Great Central types cited.

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It is reported authoritatively that the next batch of engines of the "Claughton" type are to have larger boilers, but whether the increase will be made in diameter or length I am unable to say. Other locomotives exceedingly well supplied in the matter of heating surface are the three superheater "Atlantic" types on the list, steam production always being a special feature of this wheel arrangement; also the Caledonian "Cardean" class, the length of whose boilers is responsible for furnishing so large a total, and the new London and South Western 6 ft. 4–6–0 type, in which the wealth of heating save only the original "Precursor" type of the London and North Western Railway, but the new Great Central 4–4–0 engines approach very near this figure with 1,963 sq.ft. The latest Glasgow and South Western and Great Southern and Western types are similarly engines very well supplied in the matter of heating surface, as also the well-known and justly-famed "George the Fifth" class on the London and North Western Railway. But once again the engines that appear at the other end of the list can put up some remarkable work, as vide the performances of the Great Northern D1 class

FOUR-COUPLED ENGINES.

Type.	Railway.	Typical engine. No.	Typical engine. Name or Class.	Superheater Employed.	Heating Surface. Tubes	Heating Surface. Fire-box.	Heating Surface. Super h'ter	Heating Surface. Total	Grate Area.
					sq. ft.	sq. ft.	sq. ft.	sq. ft.	sq. ft.
4–4–2	G.N.R.	1452		Schmidt	1909	144	343	2396	31·0
	L.B. & S.C.R. ..	421	(Class H2)	,,	1827	137	547	2511	31·0
	N.E.R.	722	(Class Z1)	,,	—	—	—	2340	27·0
4–4–0	Caledonian R. ..	120		Robinson	1187	145	295	1627	21·0
	G. & S.W.R. ..	131	(6 ft. class)	Drummond	1736	148	†	1884	27·6
	G.C.R.	429	*Sir Alexander Henderson*	Robinson	1502	157	304	1963	26·0
	G.N.R.	51	(Class D1)	Schmidt	852	120	258	1230	19·0
	G.N.R. (I.) ..	174	*Carrantuohill*	,,	975	141	250	1366	22·9
	G.S. & W.R. ..	341	*Sir William Goulding* .	,,	1365	156	335	1856	24·8
	G.W.R. ..	3818	*County of Radnor* .	Swindon	1223	129	215	1567	20·5
	,, ..	4101	*Auricula*	,,	1223	129	215	1567	20·5
	L. & N.W.R. ..	2663	*George the Fifth*	Schmidt	—	—	—	1850	22·4
	L. & S.W.R. ..	463		Drummond	1406	148	170	1724	27·0
	L. & Y.R. ..	1112	(Re-built class)	Schmidt	778	108	210	1096	18·8
	Midland R. ..	483	(Re-built class)	,,	1045	127	313	1485	21·1
	N.B.R.	400	*The Dougal Cratur* ..	,,	1167	140	355	1662	21·3
	N.S.R.	38		,,	887	133	261	1281	21·0
4–4–4T	N.E.R.	2143	(Class D)	Schmidt	935	124	273	1332	23·0
4–4–2T	G.W.R. ..	2221		Swindon	907	122	185	1214	20·5
	L.B. & S.C.R. ..	22	(Class I3)	Schmidt	850	126	305	1281	24·0
	N.S.R.	8		,,	887	133	261	1281	21·0
2–4–2T	L. & Y.R. ..	227		,,	—	—	—	920	18·8

T Tank Locomotives.
† Smoke-box steam drier only.

surface is rendered possible by the large boiler diameter. So far as performance goes, however, the ten-wheeled express engines whose totals are at the bottom of the scale are all noted for their work—the Glasgow and South Western engine No. 129, the Great Eastern Railway 1500 class, and the London and North Western "Prince of Wales" class, which is now being multiplied extensively.

Among the 4–4–0 engines a great increase in boiler dimensions will be noticed as compared with those of the table that appeared three years ago. No 4–4–0 engine has yet appeared with 2,000 sq. ft. of heating surface, detailed in the present issue, or of the Lancashire and Yorkshire rebuilt superheater 4–4–0 type, which I hope to give next month. The same remarks apply to the tank engines. For instance, it is indeed extraordinary to see one of the superheater 2–4–2 tanks of the Lancashire and Yorkshire Railway, with only 920 sq. ft. of heating surface, taking turns with one of the vast 4-cylinder 4–6–0 express engines of the same company on the Manchester-Blackpool and other services, and doing just as well into the bargain. On the other hand, certain modern tank engines have very large boilers, as the Midland 4–6–4 and the Great Central and London, Brighton

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and South Coast 4–6–2 engines. Talking of the latter company, it is a curious coincidence that the total heating surface of the Brighton I3 class 4–4–2 tanks is exactly the same to a foot as that of the North Staffordshire Railway engines of the same wheel arrangement, seeing that the appearance of the two types is also so very similar.

The development of the fire-box is proceeding hand-in-hand with that of the boiler in modern express locomotive types. Here again "The Great Bear" easily outstrips all 7 in. engine having 31½ sq. ft., and the 6 ft. engine 30 sq. ft. The only other express locomotive type which has a fire-grate with a larger area than 30 sq. ft. is the "Claughton" class of the London and North Western Railway, with 30½ sq. ft. After this comes a drop of 3 sq. ft., almost all the remainder of the ten-wheeled engines having fire-grates with an area of from 26 to 27 sq. ft., and also some of the larger 4–4–0 engines, as the Glasgow and South Western, Great Central and London and South Western latest types.

SIX-COUPLED ENGINES.

Type.	Railway.	Typical Engine.		Superheater Employed.	Heating Surface.				Grate Area.
		No.	Name or Class.		Tubes	Fire-box.	Superheater	Total.	
					sq. ft.	sq. ft.	sq. ft.	sq. ft.	sq. ft.
4–6–2	G.W.R. ..	111	*The Great Bear*	Swindon	—	—	—	3401	42·0
4–6–0	Caledonian R. ..	903	*Cardean*	Schmidt	1666	148	516	2330	26·0
	G. & S.W.R. ..	129		,,	—	—	—	1852	25·0
	G.C.R.	423	*Sir Sam Fay*	Robinson	2220	167	430	2817	26.0
	G.E.R.	1500		Schmidt	1489	144	286	1919	26·5
	G.W.R. ..	4041	*Prince of Wales*	Swindon	1599	155	287	2041	27·1
	,,	2934	*Butleigh Court*	,,	1599	155	287	2041	27·1
	L. & N.W.R. ..	2222	*Sir Gilbert Claughton* ..	Schmidt	1647	171	414	2232	30·5
	,,	819	*Prince of Wales*	,,	–	—	—	1898	27·0
	L. & S.W.R. ..	447	(6 ft. 7 in class)	Drummond	1636	140	†200	1976	31·5
4–6–0M	Caledonian R. ..	179	(5 ft. 9 in. class)	Robinson	—	—	—	1970	21·0
	G.C.R.	4	*Glenalmond*	Robinson	2220	167	430	2817	26·0
	L. & S.W.R. ..	482	(6 ft. class)	*Schmidt	1759	167	394	2320	30·0
	N.E.R.	782	Class S2	Robinson	1173	144	504	1821	23·0
2–6–0M	Caledonian R. ..	37		Schmidt	1071	119	270	1460	20·6
	G.N.R.	1630	(Class H2)	,,	981	137	303	1421	24·5
	G.W.R. ..	4331		Swindon	1350	129	212	1691	20·6
	L.B. & S.C.R.	337		Robinson	1156	139	279	1574	24·8
4–6–4T	Mid. (L.T.S.) R.	2100		Schmidt	—	—	—	1446	25·0
4–6–2T	G.C.R.	165		Robinson	1294	141	214	1649	21·0
	L. & N.W.R. ..	2667		Schmidt	—	—	—	1475	23·9
	L.B. & S.C.R. ..	326	*Bessborough*	,,	1398	125	382	1865	25·0
2–6–2T	G.W.R. ..	3121	(5 ft. 8 in. class)	Swindon	907	122	185	1214	20·0

M Mixed Traffic Locomotives.
T Tank Locomotives.
* Certain of these engines are fitted with the Robinson superheater.
† Water tube heating surface.

competitors with a generous allowance of 42 sq. ft., no rival coming within 10 feet of this large figure. "Atlantic" type engines possess the like advantage of a trailing carrying axle under the fire-box, and are generally well provided in this respect, the Great Northern Railway and London, Brighton and South Coast Railway "Atlantics," for example, having each a grate area of 31 sq. ft. An ample grate is always a feature of London and South Western design, and the 4–6–0 locomotives included in the table are no exception to this rule, the 6 ft. There is a great variety in the case of the 4–4–0 wheel arrangement, two of the types, both referred to in the previous paragraph as notable from the performance standpoint—the Great Northern Railway D1 class and the Lancashire and Yorkshire Railway rebuilt 4–4–0 engines—having less than 20 sq. ft. each. But heating surface and grate area considered without reference to other leading dimensions do not really convey much meaning, and we will therefore turn now to performance, leaving the question of the relation of certain of these dimensions to

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each other for consideration in next month's article.

In view of the general use of 4–4–2 locomotives for express traffic on the Great Northern Railway, the fact that a 4–6–0 engine has been working over a portion of the G.N. main line for some time is a matter of more than passing interest. As is well known, the Great Central Company has for some years worked the 4.50 p.m. (until lately 4.48 p.m.) express from Sheffield to Grantham, *en route* to London, the engine returning to Sheffield at 8.5 p.m. with the Manchester portion of the 6.5 p.m. express *ex*-King's Cross. The up train is light, loading usually to only three eight-wheelers and a twelve-wheeled dining car; it calls conditionally (and generally) at Worksop, but

Photo] [*H. B. Gamble.*

MIDLAND RAILWAY.

11.30 a.m. Scotch express; Compound locomotive No. 1009.

does not stop at Retford, although passing the latter station at a dead slow rate of speed. With the Markham bank immediately following, there is a very tight allowance of 34 min. only for the 33¼ miles from Retford to Grantham. As far as Retford the down train loads heavily, having portions for Hull and Newcastle in addition to that for Manchester, and generally making up to nine vehicles, at least four of which are twelve-wheelers. Consequently it requires good going to reach Retford in 37 min. to the stop from Grantham, but it is very rare indeed for a Great Central driver to lose any time on this section. The locomotive working of these trains affords one of the rare opportunities available of directly comparing the work of different companies' locomotives over thes same stretch of line.

A number of different Great Central engines have been tried on this service, the most remarkable of which, from the performance point of view, was probably the experimental 3-cylinder simple "Atlantic" No. 1090. This, however, was and still is a "spare" engine, and drivers were inclined to let her "show her paces" with rather more freedom than they might do with their own machines. The ordinary 2-cylinder "Atlantics" have also been used at different times, and, further, the small 4–4–0 engines of Mr. Harry Pollitt's design have done duty for considerable periods in the past, usually with remarkable success. At the present time 4–6–0 locomotive No. 196 is engaged on these trains, and is doing well in each direction. No. 196 is one of the two experimental 4–6–0 engines with 6 ft. 9 in. wheels —the first of this wheel arrangement to appear on the Great Central Railway— which were built by Mr. Robinson to run in competition with standard "Atlantics" when originally introduced. I have timings made behind all the four types of engine mentioned, on the 8.5 p.m. *ex*-Grantham, and the time is now opportune to fulfil a promise made in these columns some time ago and to give in tabular form a *resumé* of my best runs northward from Grantham, behind both Great Northern and Great Central engines. The number of types involved afford a striking study of locomotive

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GREAT NORTHERN RAILWAY—GRANTHAM TO RETFORD AND DONCASTER.

Distance (miles).			Great Northern Locomotives.												Great Central Locomotives.			
	No. of run		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Train (p.m.)‡		7.31	7.31	7.31	7.31	7.31	4.26	4.26	7.31	12.5	7.31	12.5	7.31	8.5	8.5	8.5	8.5
	Engine No.		235	1008	266	268	1384	57	57	983	258	1450	1405	1456	698	263	1090	196
	Type		*2-2-2	4-2-2	4-2-2	4-2-2	4-4-0	*4-4-0	*4-4-0	†4-4-2	†4-4-2	4-4-2	4-4-2	*4-4-2	4-4-0	4-4-2	§4-4-2	4-6-0
	Load (axles)		26	26	26	34	36	45	53	26	52	26	50	36	42	38	38	44
	Load (tons)		200	200	200	260	270	315	375	200	370	200	360	270	305	275	275	320
0	Grantham	dep.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 d	0.00	0.00	0.00	0.00
6¼	Hougham	pass	9.20	9.50	8.20	9.05	8.55	9.00	9.25	8.05	9.15	8.55	9.15	11.15	8.05	8.35	8.00	8.35
14¼	Newark	,,	17.05	17.15	15.20	16.15	16.15	16.15	16.55	14.50	16.45	16.15	16.25	19.35	15.15	15.55	14.45	15.45
21¼	Carlton	,,	23.20	23.15	20.50	21.50	21.50	21.55	22.40	20.05	22.35	21.45	21.55	25.25	20.55	21.55	20.25	21.10
27	Tuxford	,,	29.30	29.10	26.20	27.55	27.35	28.00	29.00	25.25	28.50	27.35	27.50	31.35	26.50	27.50	26.35	26.55
33¼	Retford	,,	36.50	36.25	33.50	35.35	34.15	35.55	37.05	32.05	36.20	34.25	35.40	39.05	34.25	35.25	34.40	34.40
38¼	Ranskill	,,	42.20	41.40	39.15	41.15	39.15 b	41.00	42.25	37.50	42.20	39.40	41.35	44.20	STOP	STOP	STOP	STOP
42¼	Bawtry	,,	46.05	45.05	43.00	44.55	43.40	44.35	46.05	41.40	46.05	43.30	45.20 c	47.50	—	—	—	—
50¼	Doncaster	,,	56.10 STOP	56.50 a	51.45	53.40	53.05	53.40	55.40 STOP	50.40	56.00	51.45	55.15	56.15	—	—	—	—

‡ *Ex*-Grantham. * Superheater engine. † Small-boilered type. § Three-cylinder simple. a Relaying check, Rossington. b Slack for troughs, Scrooby. c Signal check, Black Carr junction. d Severe checks, Peascliffe Tunnel and relaying near Hougham.

development, including the 2-2-2 wheel arrangement, the 4-2-2 in two forms, the 4-4-0 in three, the 4-4-2 in five distinct types, and the 4-6-0 arrangement—twelve express locomotive types of different classes, both non-superheater and also superheater-equipped.

In all, sixteen runs will be found tabulated, as it has been difficult in some cases to select a "best" run, owing to variations of load, and I have, therefore, in these cases shown the fastest runs behind the types in question with light and heavy loads respectively. At this point the grades might be mentioned. From Grantham for 2 miles to Peascliffe Tunnel the line is level: thence for about 9 miles the grades are falling, commencing with 1 mile at 1 in 440; then follow 2 miles at 1 in 200, and 2 at 300. Commencing 11 miles beyond Grantham, there is a level stretch of about 11½ miles across the Trent valley; then comes Tuxford bank, with 1 mile up at 1 in 300, 3 miles at 1 in 200, and 2 miles further at broken grades to Markham Box. Thence there is a sharp fall at 1 in 200 and 178 for 3¼ miles almost into Retford, with a second level or slightly undulating stretch for 9 miles to within a mile of Bawtry. Finally there is a short 3-mile rise to Piper's Wood Box, and 2¾-mile fall beyond, each mainly at 1 in 198, with a level 4 miles into Doncaster. The first two runs were made some years ago, and illustrate the work of the 2-2-2 7 ft. 6 in., and the more famous 4-2-2 8 ft. 1½ in. single-drivers of the late Mr. Patrick Stirling's design, on two rare occasions when engines of these types worked the 5.30 p.m. *ex*-King's Cross forward from Grantham. As these are the only two such runs I possess, I do not suggest that they are exceptional in any way, but for comparison they furnish interesting reading. No. 235 would probably have passed Doncaster in 55 min., but at this stage developed internal trouble of some kind, and had to be taken off. A very slow start was made by No. 1008, as might be expected with driving wheels of so large

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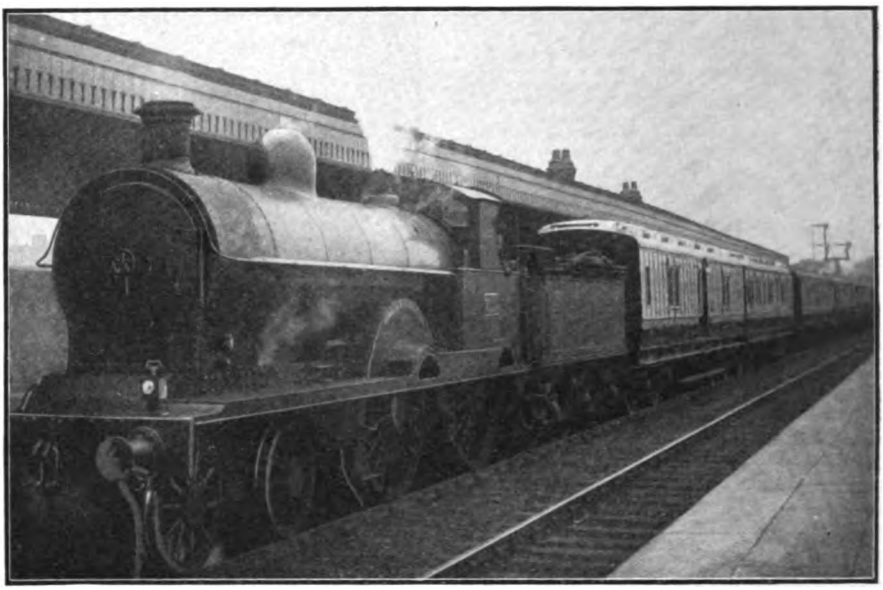

LONDON AND NORTH WESTERN TRAIN IN MANCHESTER SOUTH JUNCTION AND ALTRINCHAM STATION, LONDON ROAD, MANCHESTER.

a diameter, but some fine running followed, such times as 13 min. 25 sec. for the 15 miles from Hougham to Carlton, and 8 min. 40 sec. for the 9¼ level miles from Retford to Bawtry indicating really fine work on the part of the engine. Doncaster would have been passed in 54 min. but for a bad permanent way check beyond Rossington.

I have always found Mr. Ivatt's handsome bogie "singles" of the 266 class capable of excellent work, and runs 3 and 4 are no exception to the rule, the first, with a load of 200 tons, being positively brilliant. For a single-driver the start was astonishing, taking fourth place in the whole table. Speed averaged 72 miles per hour from Hougham to Carlton, where "even time" had been improved on, but thenceforward the running was easier in character, particularly from Markham summit to Retford, where a pronounced slack was made. Otherwise we should probably have passed Doncaster in less than 51 min., but as it was a fine ascent to Piper's Wood took us from Bawtry to Doncaster in the fast time of 8¾ min., and through the latter town in 51¾ min. No. 4 run is more recent, and shows the work of this class with a heavier load. The same characteristics are again apparent—a fast start to Carlton, a moderate time from Tuxford to Retford, and excellent work over Piper's Wood summit. It is a matter of no little regret to me that of recent years these engines have been taken off this train. I have a very large number of timings made behind them, and have found them quite the most consistent time-keepers on the Great Northern Railway when reasonably loaded. As far as load goes, moreover, I have it on reliable authority that an engine of this type has kept time on this train—94 min. from Grantham to York—with no less than 52 axles behind the tender.

The next type to appear in the table is Mr. Ivatt's 4–4–0 class W, represented by No. 1384 in a run of first-class merit, still on the same train, with a fairly heavy load of 270 tons. There is a close correspondence in starting with the preceding run, but the coupled engine did some notable work up to Markham, not falling below 52·9 miles per hour at the summit, while beyond Retford the running also was exceptionally fast. We should nearly have attained "even time" at Bawtry had we not slacked severely over Scrooby troughs, for no apparent reason. But for this delay we should have been through Doncaster easily in 51½ or 52 min. With the superheater engines of the same wheel arrangement, class D1, I have had several notable runs, of which the two specimens in columns 6 and 7 are well worthy of comment. In both cases the train concerned was the 2.20 p.m. *ex*-King's Cross, which, with its 58-min. schedule to Doncaster, offers no particular incentive to haste when the train is on time. There is no really exceptional feature about No. 6 run, save the fast

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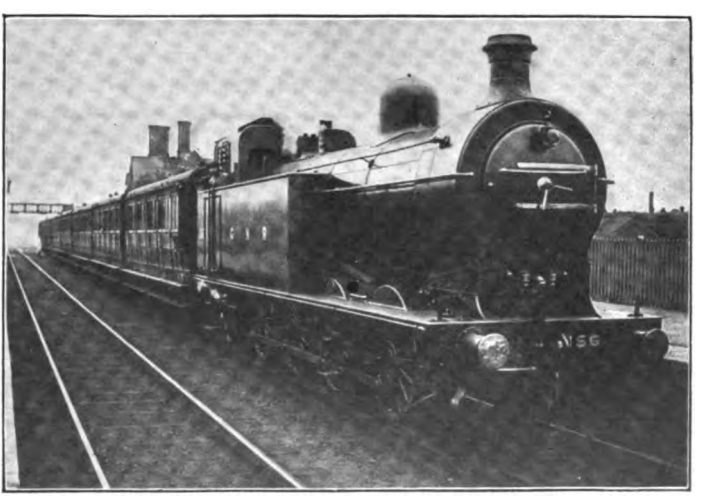
time of 8 min. 40 sec. from Retford to Bawtry, but it is curious to observe how closely this run follows the one behind No. 268 shown in column 4. No. 7 I consider an excellent run for this type of engine with a very heavy load. The start was comparatively slow, as might be expected, but after Retford No. 57 did brilliantly, covering the 9¼ level miles to Bawtry in 9 min., and the 8¼ miles thence over Piper's Wood summit to a stop (always made on Saturdays) at Doncaster in 9 min. 35 sec. On Tuxford bank the lowest recorded speed was 40·6 miles per hour. It will be seen that the time taken from Grantham to Doncaster was only 40 sec. over the schedule of the crack 10.10 a.m. *ex*-King's Cross, whose normal load is 19 axles less—maximum about 11 axles less—than that taken on this occasion, and which is invariably hauled by an "Atlantic."

We now come to the 4–4–2 classes, and in columns 8 and 9 are shown runs made behind engines of class Y, the small "Atlantics" with original boiler. These are curiously variable engines, as far as performance goes; at times they can be record-breakers of the first water, but on other occasions they are unaccountably sluggish. No one will doubt their capabilities, however, after noticing the brilliant feat that occupies column 8. This is the fastest run I have ever made north of Grantham on the Great Northern Railway, and the train was again the 5.30 p.m. down. At Newark "even time" had been all but attained, after a flight at 77·5 miles per hour past Claypole; across the valley of the Trent speed was well maintained, and the climb to Markham with the descent to Retford were achieved in the record time of 12 min., giving the somewhat startling time of 32 min. 5 sec. from Grantham to Retford. A very pronounced slack was made at Retford, however, and the running thenceforward was not quite up to the previous standard, although the time of 50 min. 40 sec. to Doncaster still left us 5 sec. inside "even time." In column 9 is shown the work of a class Y engine with a heavy load, which affords an interesting comparison with that of the superheater D1 in column 7, under similar conditions. The "Atlantic" had the advantage to Retford, which was passed in a really smart time, but again the work fell off thence to Doncaster, the comparison on the whole distinctly favouring the 4–4–0 engine. In the last-mentioned instance the train was the 10 a.m. *ex*-King's Cross, also allowed 58 min. to Doncaster.

Finally we have the large "Atlantics." In column 10 is shown my best run with an engine of this type hauling a light load—on the 5.30 p.m. down—but the work of No. 1405 does not come up to that of No. 983, particularly in the start. Beyond Retford, however, there was a decided quickening, the time of 17 min. 20 sec. from Retford to Doncaster being one of the fastest of the series, while the 8¼ min. from Bawtry to Doncaster was exceptionally fine. The run in column 11 was one of the products of the Coal Strike period, also on the down day "Scotsman," and was quite noteworthy, the start in particular being brilliant. A speed of 75 miles per hour was touched at Claypole, and the time of 12 min. 40 sec. from Hougham to Carlton was excellent, as also the climb to Tuxford. But for a slack outside Doncaster, we should probably have passed that town in less than 55 min. Run No. 12, strangely enough, represents the only *down* run I have ever timed north of Grantham behind a superheater "Atlantic"—with the exception of certain runs on the 1.30 p.m.



Photo] [*F. H. Gilford.*

GREAT NORTHERN RAILWAY.

Local train at Basford (Notts) drawn by rebuilt 0-8-2 tank engine No. 156.

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ex-King's Cross, which does not call there—and I do not pretend that it fairly represents the work of the class as a whole. We were badly checked at the start both by repairs to Peascliffe Tunnel and a relaying caution near Hougham, whereby we lost quite 3½ min. in all, but after Newark the engine picked up well. Beyond Retford we had the fastest time of the whole 12 runs, the 17½ miles to Doncaster being covered in the record time of 17 min. 10 sec. The net time to Doncaster was one of about 52¾ min., but under the circumstances, which included a late start from Grantham, I was expecting finer work, more particularly as No. 1456 has given me nearly all my best runs in the reverse direction.

The last four columns are occupied with details of the performances of Great Central engines on the 6.5 p.m. *ex*-King's Cross, the allowance in this instance being 37 min. from Grantham to the stop at Retford—equivalent to the passing time of 36 min. allowed to the 5.30 p.m. down. It should be added that these runs were, just as in the case of the Great Northern runs, made purely in the course of ordinary travel, and without preliminary conversations with drivers. It is necessary, also, to add that these are the *only* runs I have ever made on the 6.5 p.m. down, whereas the Great Northern runs were selected from a very large number timed on the various trains mentioned: as chance examples of running, therefore, these four runs with Great Central engines must be held to afford a remarkable tribute to Great Central locomotive performance. Run No. 13 is, in my opinion, the finest of the whole series. The weather was misty, rails greasy, and there were occasional heavy snow showers; the load was above the average of these sixteen runs, and yet the engine was one of the small 4–4–0's of Mr. Harry Pollitt's design, which now but rarely appear on first-class express service on the Great Central Railway. Under these circumstances the times are astonishing. The start to Hougham has only two rivals, the load in one instance being about two-thirds that hauled on this occasion, and the engine in the other being of a very much more powerful type. In the matter of high speed, the time from Hougham to Carlton was brilliant, only 12 min. 50 sec. being taken for the 15 miles, with a sustained speed of 73·8 miles per hour for some distance, while as regards hill-climbing, the time from Carlton to Tuxford was up to that of nearly all the runs of ten-wheeled engines with equal loads, the minimum rate up the bank being 45·8 miles per hour. In both starting, fast running, and hill-climbing, therefore, this veteran thoroughly distinguished himself. It should be added that Driver Owen was in charge on this run.

There is no point calling for special remark about run 14; the train was well on time, and there was, therefore, no occasion for undue haste. The maximum speed at Claypole was 73·8 miles per hour, and the minimum at Markham Box 52·9; despite this comparatively easy running, however, over 1½ min. were economised on schedule time. In run 15 also a punctual start prevented

Photo] [*F. E. Mackay.*

LONDON AND SOUTH WESTERN RAILWAY.

Two-hour Bournemouth Express; 4-6-0 locomotive, No. 446.

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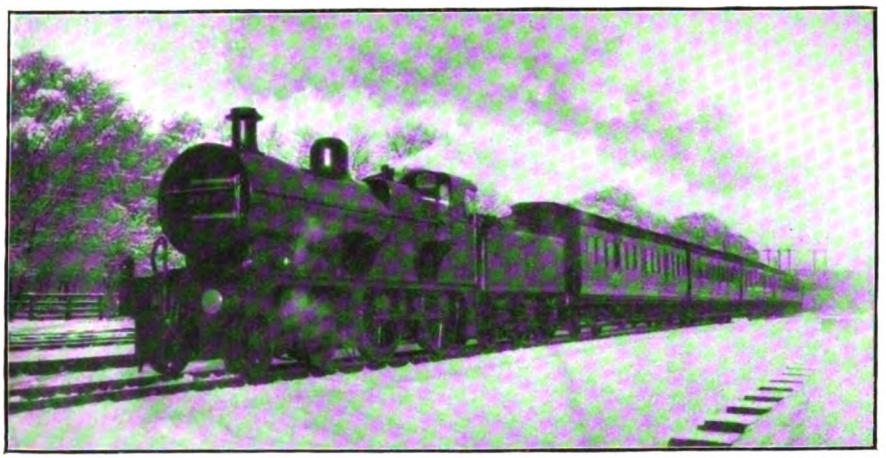
anything exceptional being attempted, but otherwise I do not doubt that this run would have defied competition. The start was the fastest I have ever recorded on this stretch of line, speed being sustained at 77·5 miles per hour for some distance beyond Claypole, while "even time" had been attained at Newark. Then, however, came a very pronounced easing off, with a minimum speed of 47·9 miles per hour at Markham, so that the time to Retford was not a record one. Finally, in the last column, is found the run with No. 196, made under the capable management of Driver Hadwick, who also, strangely enough, was in charge of No. 1090 on the previous run. Out to Hougham the start was good, but not exceptional; then matters brightened up considerably, and a fast time was made from Hougham to Newark with a maximum of 75 miles per hour at Claypole, and a sustained speed of 73·8 thence to Newark. Across the Trent valley to Carlton the engine did extremely well, speed at the latter point not having fallen below 67 miles per hour, while up the bank to Tuxford the time was the fastest of all runs but one—No. 8—when the load was less than two-thirds of that hauled on this occasion. The time on run 5 was the same, but here the load was considerably less also. At Markham Box the minimum speed was 48·4 miles per hour. It is worthy of note that, on every occasion on which I have timed this train, the Great Central drivers have gained substantially on schedule time, from 1½ to 2½ min. on this short run, with its sharp timing.

It is impossible, of course, to draw any deductions of value from these runs, as many of them, being the best that I possess, were made under special circumstances, as, for instance, a late start, so that as a whole the trips cannot be said to represent *average* running. One or two facts, however, stand out notably. The best runs are undoubtedly those with the two early 4–4–0 engines—No. 1384 on the Great Northern Railway (column 5) and No. 698 on the Great Central Railway (column 13). Whether or no the engines were thrashed to secure these startling results I am unable to say, but from this it would seem that the provision of a large boiler, with ample heating surface, is not a *sine quâ non* in the matter of locomotive performance. Curiously enough, the same contrary evidence is afforded in the work of the Great Northern "Atlantics," the fastest work standing to the credit of one of the small "Atlantics" of class Y. It seems also that, with moderate loads, the bogie single-drivers of the 266 class on the Great Northern Railway are capable of practically as good work as the "Atlantics"; it will be noticed that No. 266 in column 3 was not far behind No. 983 as far as Tuxford, and also beat the times of No. 1405. As regards a comparison of the work of 4–4–2 and 4–6–0 engines, it is impossible to base this on one run only in the latter case; No. 196 certainly did quite well, showing no deficiency in the matter of either speed or hill-climbing, but one would prefer a comparative test on a more hilly road, as, for example, the Great Northern



Photo] [*T. Preston.*

A SNOW SCENE NEAR YORK.

12.22 p.m. York-Bristol (Midland) Express passing Chaloner Whin.
Rebuilt 4–4–0 locomotive No. 387.

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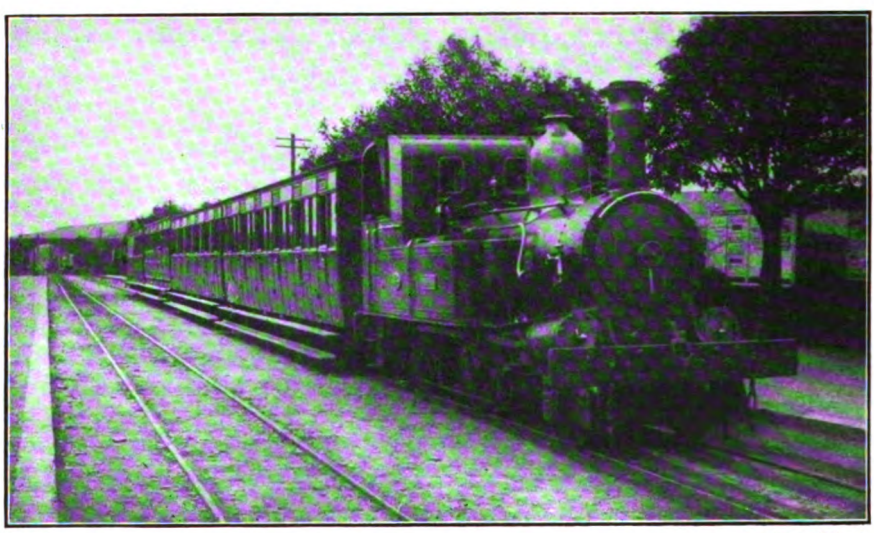
Railway south of Grantham. These comparisons, however, are full of interest, and lovers of the past of British locomotive design will, I feel sure, welcome this indication of the powers latent in many of the historic locomotive types still at work in this country.

As a complement to the account of the down run, a description of a journey from Sheffield to Grantham on the 4.50 p.m. up express behind No. 196 is necessary to complete a review of the work of this engine on Great Northern metals. A light load only is taken on this train, consisting on this occasion of three eight-wheelers and a twelve-wheeled dining car, or 135 tons in all. The first part of the journey is generally very slow, and this run was no exception: we slowed to a walking pace for the opening out of Darnall Tunnel, and were also slacked severely for signals at Woodhouse. Consequently 9 min. 20 sec. were taken to Woodhouse, 5 miles; 17¼ min. to Kiveton Park, 10¼ miles; and, after a short spurt at 70 miles per hour past Shireoaks, 22½ min. to Worksop, 15½ miles. The conditional stop was made here, which occupied 45 sec. Starting again briskly, we were slacked severely for permanent way work near Checker House, but then attained 67 miles per hour before the prolonged and very serious check through Retford. We passed the centre of the latter station, 7½ miles from Worksop, in 11¾ min.; with all the hindrances encountered, our time from Sheffield, 23 miles, was 35 min.—5 min. in excess of schedule—making a punctual arrival at Grantham out of the question. However, Driver Hadwick went gamely for Askham bank, accelerating his engine up the 1 in 178 and 200 to 51 miles per hour, and passing Tuxford, 6¼ miles from Retford, in 8 min. 20 sec. On the falling grades to Carlton a top speed of 77·5 miles per hour was touched, and after the level 6½ miles thence to Newark the rate had not fallen below 71·4 miles per hour. So the 12¼ miles from Tuxford to Newark were covered in 9 min. 50 sec. The uphill work beyond Newark also was fine; at Claypole, after 2½ miles up at 1 in 220 to 330, we were doing 64·3 miles per hour; at Hougham, after 3 further miles up at 1 in 300 to 550, exactly 60; and at Peascliffe Tunnel, after one more mile at 1 in 300 followed by 2 at 1 in 200, it was 52·9. Thus we reached Grantham in 14 min. 55 sec. from Newark (14¾ miles) and in 33 min. 5 sec. from Retford (33¼ miles), a minute having been gained on the very tight schedule from the last-mentioned point. The 56¼ miles from Sheffield had taken 68 min. 5 sec.—4 min. over schedule—but the observance of booked time under present conditions is absolutely impossible.



Photo] [*F. H. Gillford.*

ISLE OF MAN RAILWAY.

2.35 p.m. Douglas-Peel train at St. John's. Locomotive No. 8 *Fenella.*

Before closing, as I have been dealing with Great Central performance, I wish to accede to the request of a correspondent in giving some details of the work of the latest

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4–4–0 superheater engines of the same company. The engine in question was No. 431, *Edwin A. Beazley*, and the load five of the latest corridor eight-wheelers with restaurant car, and one non-corridor—all very heavy stock—together with a horse-box, totalling 225 tons behind the tender. This is a comparatively large load for the Great Central Railway London Extension, especially on so tightly timed a train as the 12.15 p.m. train *ex*-Marylebone, but throughout the journey excellent work was performed, time being gained on every section. We had barely started from Marylebone when we were checked to a "crawl" for the London and North Western widening works at London Road, and so took 10 min. 40 sec. net 35 min. (booked 36) for the 27⅞ miles from Marylebone. Smart work also followed to Princes Risborough, again with a very slow approach to the stop; a minimum speed of exactly 50 miles per hour was maintained up the 1 in 164 past Saunderton, and we covered the 8⅛ miles to Risborough in 12 min. 10 sec., start-to-stop, although booked 13.

There now follows a fast booking, 30 min. only being allowed from Risborough to leaving Brackley, 27¾ miles. Here the work was a little disappointing, as the driver did not make nearly as much use as is customary of the falling grade past Haddenham. Indeed, the maximum speed did not exceed 66·1 miles per hour. Thus we took 11 min.

Photo] [*H. T. Worlock.*

MIDLAND RAILWAY:

Up Harrogate Express, near Elstree. 4–4–0 locomotive No. 704.

to pass Neasden, 5⅛ miles out, where the usual junction slack was made. From that point to Northolt Junction, where we slacked again, the 6½ miles occupied 8 min. 10 sec., leaving us still nearly 2 min. behind time. Thenceforward, however, we did well, accelerating to 60 miles per hour at Denham, and not falling below 52·9 on the long climb at 1 in 175 and 264 to Beaconsfield; the 4½ miles Northolt to Denham took 5 min., the 6⅞ miles thence to Beaconsfield 7 min. 40 sec.; while the 4⅞ miles from there to High Wycombe, with a very slow descent of the bank (not exceeding a maximum of 64·3 miles per hour) took us 5½ min. The total time from London was thus 37 min., to pass Ashendon Junction, and 16¾ min. to Grendon Underwood (15⅝ miles)—¾ min. over schedule time; this was due to no inability of the engine to run at high speeds, as we see later. Beyond Grendon, however, No. 431 did magnificently. At the top of the 2½ miles up past Calvert, mainly at 1 in 176, we were running at 56·3 miles per hour; ¾-mile down at the same inclination raised the speed to 60, while the long 5-mile climb to Finmere, 3 miles of which is at 1 in 176, only reduced the speed to 55·6 miles per hour. The short 1¼ miles down at 176 beyond Finmere raised the rate to 69·2 miles per hour, and we stopped at Brackley in exactly 13 min. from Grendon, 12⅜ miles nearly

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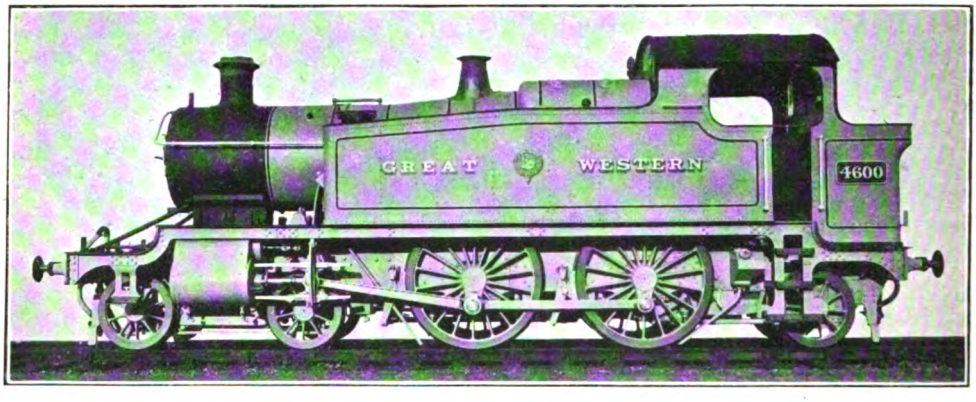
all uphill—28¾ min. from Risborough. From Brackley to Woodford we covered the undulating stretch of 9¾ miles in 12 min. 40 sec. against a booking on 13 min. On the next section the new engine showed a marked ability for speed. Charwelton, 2⅝ miles uphill from Woodford, was passed in 4 min. 25 sec., and on the long 1 in 176 descent to Braunston, despite severe applications of the brake, we attained and maintained a speed of 78·9 miles per hour, reaching Rugby, 14⅛ miles from Woodford, in 15¼ min., start-to-stop. This run is booked 16 min. From Rugby we passed Lutterworth, 6¾ miles distant, in 8 min. 35 sec., this length having a slightly falling start, followed by a rise of 1 in 176 for 3 miles; our minimum speed up the 1 in 176 beyond Lutterworth was 52·3 miles per hour, and we then ran at a moderate speed down the long descent to Leicester, brakes being applied more than once, and no speed higher than 75 miles per hour being attained. The 19⅞ miles from Woodford to Leicester took 20 min. 55 sec., although allowed 22 min. This run, therefore, shows in marked fashion the capabilities of the new type, which are of a very high order, and it is specially worthy of note that the uphill work is of a most satisfactory character, speeds of from 52 to 56 miles per hour being easily maintained up continuous grades at 1 in 176, which practice allows of more moderate running downhill.

New "Light" 4-4-2 Passenger Tank Engine: Great Western Railway.

Designed by Mr. G. J. Churchward, Chief Mechanical Engineer.



Passenger tank engines of the 4–4–2 type, hitherto employed on the Great Western Railway, have been exclusively of express and main line classes; but Mr. Churchward has now introduced a corresponding design, described as "light," though the engines are of considerable size, intended for branch line and local traffic. Coupled wheels and cylinders are smaller than in the main line classes, and other dimensions vary in proportion. The Swindon "top-feed" is employed, but not the Swindon superheater.

LEADING DIMENSIONS.

Cylinders	17 in. × 24 in.	Heating surface—tubes	1178·01 sq. ft.
Coupled wheels	5 ft. 8 in. diam.	,, ,, firebox	93·85 sq. ft.
Bogie and trailing wheels	3 ft. 2 in.	,, ,, total	1271·86 sq. ft.
Coupled wheelbase	7 ft.	Grate area	16·6 sq. ft.
Total ,,	28 ft.	Water capacity of tanks	1100 gals.
Steam pressure	200 lbs. per sq. in.	Adhesion weight	30 tons 15 cwt.

Weight in working order .... 60 tons 12 cwt.

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The Railways of Anglesey.

[No. II.]

By G. W. J. POTTER.

Photo] [*R. J. Osborne.*

CREWE-HOLYHEAD TRAIN LEAVING THE BRITANNIA TUBULAR BRIDGE.
4-4-0 locomotive (Schmidt superheater) No. 89 *John Mayall.*

SHORTLY after leaving Bangor station an excellent view is obtained, first of the Suspension Bridge and then of the Tubular Bridge. Having passed Menai Bridge station, with its four sets of metals, this being the junction of the Carnarvon line, the Anglesey train proceeds past the site of the original Britannia Bridge station, and then curves away to the right. A hurried glance along the Menai Strait is permitted to the traveller, and he may perchance catch a glimpse of the famous stone lions guarding the bridge, ere the train enters the great tubes of the bridge.

Although the present generation is accustomed to huge modern engineering schemes and notable bridges of varied types and designs, it is prone to treat early productions somewhat lightly and even contemptuously, yet there is a fascination about this magnificent bridge which is not easily set aside. It looks majestic and stately, and the simple and austere design of the masonry, together with the sentinel lions, unite to impress the beholder with admiration.

The entrance arch at Euston has for many years been an advertising asset which counts for much, seeing that it is known throughout the civilised world. Similarly, the Britannia Bridge and its near relative, the Conway Tubular Bridge, are not only indispensable links in the chain of railway communication between London and Holyhead, but they are also "trade marks," so to speak, of great value. During the last few years the London and North Western authorities have begun to appreciate the publicity value of these architectural and engineering creations, as witness the pictures of them which have appeared on calendars, posters, and in literature of all kinds, and as time passes these and similar edifices will increase in value as definite symbols of England's premier railway system. The way of the pioneer railway is hard, like that of all first explorers, but there are compensations, and the shortest route between the principal towns is one of them; further, these early memorials of difficulties overcome are likewise of great value, especially in this age, which may truthfully be called the "age of advertisement."

Soon after emerging from the Britannia Bridge the station of Llanfair is reached. This serves the adjacent villages of Llanfair pwll gwyngyll and Llandysilio. As readers are probably aware, there are many villages in Wales bearing the name of Llanfair, and naturally it is necessary to distinguish them. In a recently published gazetteer there are found 20 parishes, villages, or towns either called Llanfair or with a qualifying addition, as Llanfair mathafarn eithaf, Llanfair y Cwmmwd, Llanfair yn Neubwll, and Llanfair yn ghornwy. These villages, together with Llanfair P.G., as it is sometimes written, are found in the one small island of Anglesey, and Llanfair is Gaer is situated on the opposite side of the Menai Strait. This latter place is concluded to be the spot where Agricola crossed from the mainland. The adjacent station on the Bangor-Carnarvon section is called Griffith's Crossing, quite a suggestive name.

Some of the names given above have a very alarming look, but worse remains to follow. The Llanfair in Anglesey, which possesses a railway station also owns probably the longest and most curious name that has ever been applied to a town or village. In its unabbreviated beauty it is "Llanfairpwllgwyngyllgogerchwyrndrobwlltysiliogogogogoch."

When broken up into its component parts

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and translated into English its poetical fitness becomes apparent. The Rev. R. Roberts, of Bradford, thus deciphers the "Great Welsh Word-Puzzle," as he terms it: "Llan —church or village; fair—St. Mary; pwll—pool; gwyn—white; gyll—hazel wood; go—hard; ger—by; chwyrn—swift; dro —whirl; bwll—pool; tysilio—St. Tysilio; go, go, go—mere jocular repetitions; goch—red or ruddy. Thus analysed, the joke may be freely rendered: The church or village of St. Mary near the pool of the white hazel wood, and hard by the swift red St. Tysilio whirlpool."

Travelling to Red Wharf Bay one day some tourists from Lancashire attempted to induce the guard—a jovial fine-looking Welshman—into pronouncing the full name of Llanfair P.G. by saying that they could not quite remember how it went. However, he had forgotten it, or said that he had, and contented himself by rolling out Llanfair-pwllgwyngyll with due Cymric sonority. It was a treat to hear his rendering of the word Amlwch when announcing the destination of the train at Gaerwen.

About a couple of miles beyond Llanfair the railway turns southward and parts company from Telford's mail-coach road. The road, founded, it is said, on the site of an early Roman road, pursues its course in nearly a straight line to Holyhead, while the railway keeps on the level marsh-like ground and at no great distance from the waters of Carnarvon Bay.

Gaerwen, situated some 2¾ miles from Llanfair, is the next station. It is a quiet yet somewhat important junction, for here the Anglesey Central line branches off, and it is also the changing-place for the Red Wharf Bay section. Branch trains are usually dealt with at a bay on the up side, though for the sake of facility in transferring passengers and luggage, the Amlwch train is sometimes backed into the down road after the departure of the main line train to Holyhead. Virtually all trains, with the natural exception of those forming the Irish Mail and Boat services, call at Gaerwen; hence access is easy to and from all parts.

Magnificent views are obtained of the Snowdonian range from the railway carriage as the train travels onward over the low-lying ground of Malldraeth Marsh. The extensive panorama which is visible to the traveller on a fine clear day is probably unsurpassed, and gives a very comprehensive view of the mountains of North Wales.

Photo] [*L.N.W.R.*

GAERWEN STATION: THE JUNCTION FOR THE AMLWCH AND RED WHARF BAY BRANCHES.

Presently the river Cefni—the chief stream in the island—is crossed, and two short tunnels having been traversed, the station of Bodorgan is reached. Two tunnels so close together may seem peculiar, but when the line was being made, work was commenced at each end and in the middle, the central sphere of operations thus converting the tunnel into two sections. Several interesting places are within easy reach of Bodorgan, notably Aberffraw, once the chief residence of the sovereign princes of North Wales. There is a very large though ruined cromlech in the neighbourhood and Llyn Coron, seen from the train, is a noted fishing lake.

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As the journey is resumed one cannot fail to notice and appreciate the softness and fragrance of the air, and the hedges of fuchsia which border the railway track are silent yet truthful witnesses of the mildness of the climate throughout the year.

Ty Croes is the next station, and until the last few years there was a run of nearly six miles thence to Valley without an intermediate stopping place. The village of Rhosneigr became, however, such a favourite resort of visitors that some few years ago the railway authorities decided to build a station adjoining the road leading to that watering-place. On the down platform of the station the following words have been outlined in grass :—

RHOSNEIGR + OPENED + MAY + 1907.

The sands are reported to be among the best in North Wales and excellent bathing is obtainable. Fishing and boating can be pursued in sea, lake, or river. Two golf links are available, one of 9 holes and another of 12, which is now being enlarged to 18 holes.

At Valley station the railway rejoins Telford's highway and the two roads run side by side over the strait which separates Holy Island from Anglesey. This is the station which was reached by Borrow late one day, when walking across the island from Red Wharf Bay to Holyhead. He says: "I shortly passed through a large village, or rather town, the name of which I did not learn. I then went on for a mile or two, and saw a red light at some distance. The road led nearly up to it, and then diverged towards the north. Leaving the road I made towards the light by a lane, and soon came to a railroad station. 'You won't have long to wait, sir,' said a man, 'the train to Holyhead will be here presently.' 'How far is it to Holyhead?' said I. 'Two miles, sir, and the fare is only sixpence.' 'I despise railroads,' said I, 'and those who travel by them,' and without waiting for an answer returned to the road. Presently I heard the train—it stopped for a minute at the station, and then, continuing its course, passed me on my left hand, voiding fierce sparks and making a terrible noise—the road was a melancholy one; my footsteps sounded hollow upon it. I seemed to be its only traveller—a wall extended for a long, long way on my left. . . . At length I saw water on my right, seemingly a kind of bay, and presently a melancholy ship. I doubled my pace, which was before tolerably quick, and soon saw a noble-looking edifice on my left, brilliantly lighted up. 'What a capital inn that would make,' said I, looking at it wistfully, as I passed it. Presently I found myself in the midst of a poor, dull, ill-lighted town.

"'Where is the inn?' said I to a man.

"'The inn, sir? You have passed it. The inn is yonder,' he continued, pointing towards the noble-looking edifice.

"'What, is that the inn?' said I.

"'Yes, sir, the Railroad Hotel—and a first-rate hotel it is.'

"'And are there no other inns?'

"'Yes; but they are all poor places. No gent puts up at them—all the gents by the railroad put up at the Railroad Hotel.'

"What was I to do? After turning up my nose at the railroad, was I to put up at its hotel? Surely to do so would be hardly acting with consistency. . . . 'I shall go to the hotel; I have money in my pocket, and a person with money in his pocket has surely a right to be inconsistent if he pleases.'

"So I turned back and entered the railway hotel with lofty port and with sounding step, for I had twelve sovereigns in my pocket, besides a half one and some loose silver, and feared not to encounter the gaze of any waiter or landlord in the land. . . . I dined, or rather supped, well at the Railroad Inn—I beg its pardon, Hotel, for the word Inn at the present day is decidedly vulgar. I likewise slept well; how could I do otherwise, passing the night, as I did, in an excellent bed in a large, cool, quiet room? I arose rather late, went down to the coffee room and took my breakfast leisurely, after which I paid my bill and strolled forth to observe the wonders of the place."

Like most other people both before and after his time, Borrow had, perforce, to acknowledge his indebtedness to the railway for many comforts and facilities.

As far back as 1843 the inhabitants of Amlwch desired to have a railway to connect them with other parts of the island and eventually with the mainland. George Stephenson was approached on the matter, but he could not give them any encouragement, as he saw that such a scheme would not be a financial success. The matter was not decided by this rebuff, and various schemes were brought forward from time to time only to be rejected. However, in July, 1861, the first prospectus of the Anglesey Central Railway was issued, and duly received the Royal Assent on 13th

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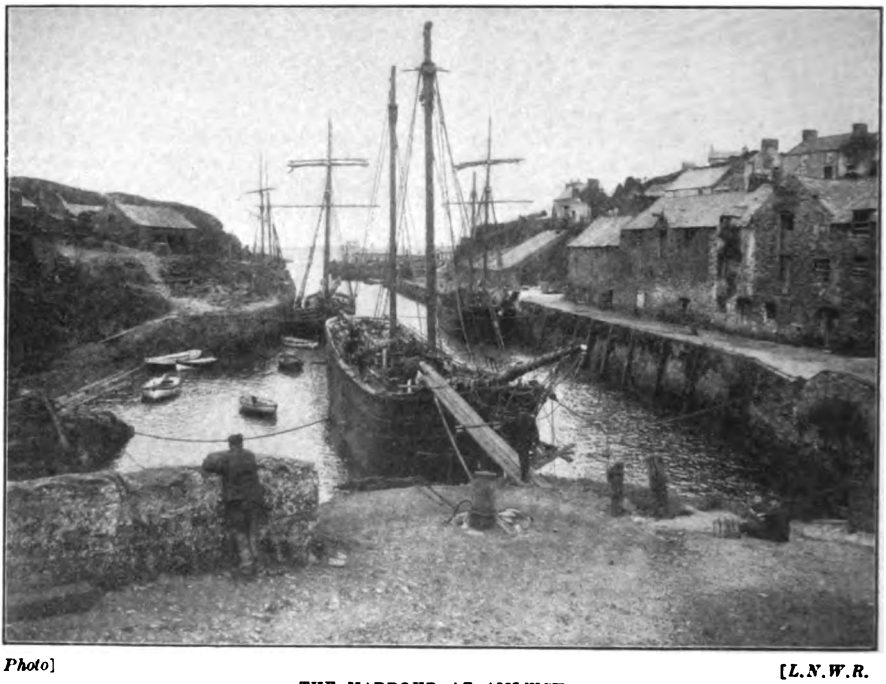
July, 1863. The Act authorised the promoters to construct a railway from Gaerwen to Amlwch, a distance of about 18¾ miles. The capital was limited to the sum of £120,000, divided into shares each of the nominal value of £10, and powers were granted to enable the company to obtain loans to the extent of £40,000.

In May, 1864, a deviation of about three miles was authorised. At the beginning of March, 1865, Captain Rich, the Board of Trade Inspector, came and examined the section from Gaerwen to Llangefni, which had been completed. This was passed by him, and passenger trains commenced to run on the 8th March. The second section, that from Llangefni to Llanerch, was opened on 1st February, 1866. The undertaking did not realise the profits which had been anticipated by the promoters, so in August, 1866, the directors obtained powers to raise new capital, also to lease or transfer the whole undertaking, should they at any time so desire, to the London and North Western Railway.

On the 3rd June, 1867, the whole line was made available for traffic by the opening of the last section from Llanerch to Amlwch. Nine years later the undertaking passed into the hands of their neighbours, the London and North Western Railway, for the sum of £80,000, and the 1st July, 1876, marked the disappearance of the Anglesey Central Railway Company as a distinct entity.

The line is single throughout, and although signals are provided, passenger trains are not permitted to cross one another at any of the intermediate stations. Provision is made that goods trains may be shunted at stations, and thus allow passenger trains to cross them as may be desired in conformity with the time-table. Usually a line like this would be worked by one train running to and fro in shuttle fashion, but the demands of the service make it necessary to employ two trains for the traffic. The service provided is quite good considering the almost entire absence of large towns on the route and the paucity of inhabitants. The summer time-table shows 8 trains running from Gaerwen to Amlwch, and 7 from Amlwch to Gaerwen, with an extra one on Monday mornings. There are no Sunday trains.



Photo] [*L.N.W.R.*

THE HARBOUR AT AMLWCH.

From Gaerwen the stations occur in the following order and at the stated distances: Holland Arms, 2¼ miles; Llangefni, 4½; Llangwyllog, 7⅛; Llanerchymedd, 11; Rhosgoch, 14⅝; and Amlwch, 17⅝. Holland Arms station is situated on the main road to

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Holyhead, and forms the junction point for the Red Wharf Bay branch. The route then runs across a level, marshy expanse of open country known as Malldraeth Marsh, and at its further side reaches the station at Llangefni. This is a busy little town possessing a market, which is held on Thursdays. Golf links are situated within easy reach, and these are available for the use of visitors.

Thence onwards by a winding route the railway runs through pleasantly diversified country, the outstanding features of which seem to be sheep, runts or the black Welsh cattle, and flowers in abundance, especially the graceful foxglove, which grows in profusion. All the stations are on a miniature scale, and the traveller has the impression that he is in a kind of toy train running along a pretty toy railway. Sometimes it would appear that there is hardly room to get under a bridge or pass through a cutting, but needless to say these are only fancies, and the train safely pursues its way. As the station of Llanerch y medd is approached, extensive and beautiful views of the Welsh mountains are obtained from the carriage windows. This town possesses quite a reputation for its horse and cattle fairs. Its central situation should prove attractive to pedestrians, and all who wish to explore the interior of the island.

Before reaching the station of Rhos-goch, the celebrated Parys Mountain is seen on the north-eastern side of the track. This mountain has for many centuries been mined for copper, lead, silver, zinc, etc., and has been the source of much prosperity to the adjacent town of Amlwch and indirectly to the whole of Anglesey.

Amlwch has a population of about 3,000 inhabitants, and possesses a harbour available for small ships. The station is small and quaint, and within view are the engine shed for one engine, covered goods shed, and ticket platform, at the further end of which is the lever frame for working the signals. Though these items take the memory back to old-time railway practice, yet the present day conditions are visibly to the fore, as one notes carriages labelled as running through to Chester, Manchester, and Liverpool, while outside in the village street there are huge touring motor char-a-bancs and motor omnibuses to distant villages, thus forming a well contrasted picture of old and new travel.

The third and most recently constructed section of the Anglesey railways traverses a bright, open, and pleasing country, slightly undulating, and throughout its length almost within sound and sight of the sea. It leaves the Anglesey Central at Holland Arms, and runs thence in a north-easterly direction to its terminus, situated at a cross-road between the villages of Red Wharf Bay and Benllech.

Curiously enough, the course taken by this modern line is nearly identical with a railway for which an Act was obtained on 9th June, 1812. The chief promoters of this early railway scheme were the Earl of Uxbridge, the Rt. Hon. Henry Paget, several of the Paget family, certain of the Griffiths, and other local landowners. The line was planned to run from a farm known as Penrhyn-mawr, situate in the parish of Llanfihangel Esgeifiog, through the parishes of Penmynydd, Llanddyfnan, Pentraeth, and Llanbedr-goch to Red Wharf. A dock or basin was there to be constructed, together with a short branch line running along the shore of the bay.

Coal mining seems to have been then carried on at the farm of Penrhyn-mawr, which is situated a little to the south of the main road from Bangor across Telford's suspension bridge to Holyhead. The promoters evidently considered that the carriage of coal, lime, chalk, ironstone, slates, flagstones, etc., would furnish the bulk of the traffic, though due provision was made for the conveyance of farm stock and merchandise. Dues were also authorised to be collected from all vessels using the wharf or entering the dock. Even in those days some of the originators were smart enough to see that there was a likelihood of passengers wishing to travel by the railway, and they were ready for such an event by having their rate fixed at one penny for each passenger riding in a carriage or wagon.

The whole length of the line was 7 miles and 81 yards. The gradients were fairly easy, and from high water mark in Red Wharf Bay were as follows: 2,901 yards rising 1 in 595, 1,746 yards rising 1 in 137, 572 yards rising 1 in 62 to the summit, thence there was a descent of 1,775 yards at 1 in 197, followed by 5,407 yards on the level to the terminus at the coal works.

Mr. W. W. Bailey surveyed the work in 1812, and his estimate for a single road, having twenty turnouts or passing-places of sixty yards each in length, was £8,797 8s. 2d., to which must be added £1,005 for the dock or basin at Red Wharf. The Earl of Uxbridge and Holland Griffith each subscribed £5,000, and the Anglesea Railway Company, as the undertaking was called,

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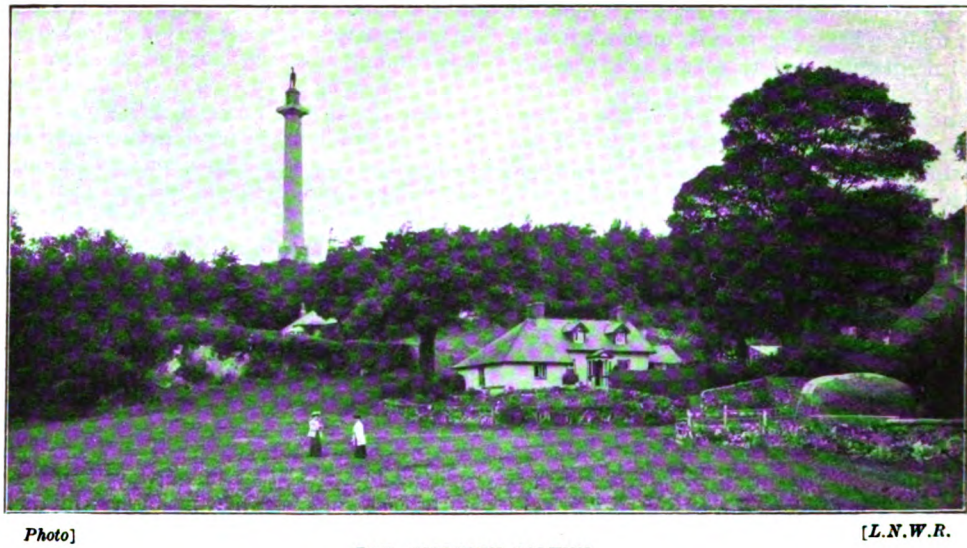
had power to raise £15,000 in shares of £150, and to borrow £8,000 on mortgage if found necessary. After all, the Penrhyn-mawr Railway, as it is sometimes styled, does not appear to have progressed beyond the authorisation stages, though possibly some little work may have been done on it. The scheme was abandoned, so that it is curious to read in a volume dated 1831 that "This is an useful work." The course of the line is shown on the large map of the Inland Navigation and Railways of Great Britain brought out by Priestley in 1831.

Until quite recently this lovely line of coast was practically an unknown and undiscovered country, and only a few pedestrians and tourists were acquainted with its charms. The continued growth of the open-air type of holiday, and the reversion to a primitive life spent in the fields and on the seashore, was so favoured by increasing numbers of people of all classes, that the London and North Western Railway decided to cater for this traffic by exploiting the charms of eastern Anglesey. To attain this end it was necessary that easier and more modern means of access should be provided, so in 1906 the construction of a railway from Holland Arms to a point not far distant from the coast at Red Wharf Bay was authorised by the Board of Directors. Legal sanction was obtained and work was soon begun; the section from Holland Arms to Pentraeth being opened in July, 1908, and the remaining portion thence to the terminus at Red Wharf Bay and Benllech in June, 1909.

The service on the Red Wharf Bay section is carried out by a motor train. This consists of two carriages, each 42 feet in length and 8 ft. 6 in. in width, and a double-ender tank engine, No. 1441 (2–4–2). The passenger vehicles, which were originally built for use as restaurant cars, have been fitted with seats having reversible backs, and upholstered in woven cane. The entrance is now at the end of the vehicle, and a gangway is provided down the centre, this communicating with the smoking and non-smoking sections. Electric light is fitted, and the wide panes of glass in the windows give ample views over the country traversed. There is only one class provided, and third class tickets, which are of the omnibus type, are issued by the guard. The combined seating accommodation of the two carriages is about 80 people, and provision is made for the storage of a considerable amount of luggage.



Photo] [*L.N.W.R.*

THE ANGLESEY COLUMN.

The engine is not detached from the train upon arrival at Red Wharf Bay, but on the return journey the driver takes his place in a special compartment at the further end of the train, where the necessary mechanism for controlling the engine has been placed, while the fireman remains on the footplate to look after the water and coal required and to carry out the details common to his usual occupation.

As no time is lost in transferring the engine from one end to the other at the conclusion of each journey, the system lends itself to the establishment of a quick shuttle service,

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and it is economical in working while porviding ample facilities for the district served. Speaking generally, shunting is out of the question unless the engine is detached. When the goods traffic is fully developed it will be then an easy matter to send an engine to deal with all the shunting that may be required at each station, and thus to provide a goods train service in each direction.

As already stated, the service on the Red Wharf Bay branch is carried on by one train only. Some interesting variations from the usual shuttle service between the terminal points are in force: thus the up journey sometimes terminates at Holland Arms and sometimes at Gaerwen; and frequently a journey is made to Llangefni, which, as a reference to the map will show, is situated on the Amlwch branch.

The motor-train leaves Bangor at 8 a.m., and calling at Menai Bridge (8.5) and Llanfair (8.10), arrives at Gaerwen at 8.15, and then takes up the service as shown in the time-book. At the conclusion of the day's work Gaerwen is left at 7.57 p.m. and Bangor reached at 8.14. On Thursdays the trip from Gaerwen to Llangefni at 4.24 is omitted, also the return from Llangefni to Gaerwen at 4.37. On Fridays the train leaving Red Wharf Bay at 7.25 p.m. runs only to Holland Arms (arr. 7.46), then returns at 7.50, reaching Red Wharf Bay at 8.11. It leaves again at 8.15, arrives at Gaerwen 8.45, and after a five minute stop, departs for Bangor, where it is due at 8.14 p.m.

This makes a service of 7 trains daily over the branch on the down journey from Holland Arms to Red Wharf Bay, and an additional one on Fridays. In the up service to Holland Arms there are also 7 trains, with an extra train on Mondays and another on Fridays.

At Holland Arms station a new platform has been provided for the accommodation of those trains which do not run through to Gaerwen, thus permitting the Amlwch and Red Wharf Bay trains to make close connections.

The first station on the branch is Ceint, which serves the village of that name. A few minutes' walk thence will bring the visitor to Plas Pen-Mynydd, the manor house of the Tudurs or Tudors, from which family descended Henry VII. Although part of the present house is very old and interesting, it is not the original structure which stood in the time of Owen Tudur. To this succeeds Rhyd-y-Saint, the meaning of which is "The ford of the Saints." Continuing through pleasant pastoral country with glimpses of quaint cottages and farms, the traveller reaches Pentraeth. Discoveries of considerable antiquarian interest have been made of late years in this neighbourhood. Whilst the work of cutting the railway was in progress, the excavators dug through an ancient tumulus, the antiquity of which was shown by the discovery of pieces of a bronze dagger. The weapon lay beside a skeleton, which was found buried in a sitting posture, in a grave formed of huge stones. A similar burial place was also discovered at a spot about a mile away. In this case a peculiar flint implement, sharpened on one side and fretted like a saw on the other, was found beside the skeleton.

A short distance beyond Pentraeth the railway curves to the left and from the right hand windows of the train an enchanting view of the lovely Red Wharf Bay is disclosed to the gaze of the traveller.

From Pentraeth it is but a few minutes' run to Llanbedr Goch, the next station, and directly afterwards Red Wharf Bay and Benllech station is reached, the present terminus of the line. This is situated at a point about midway between the two villages, though to reach the shore at Benllech entails a somewhat longer walk than if Red Wharf Bay were made the objective. Both places are charming, the scenery is beautiful, and an open-air holiday can here be spent under the most delightful of conditions.

The beautiful sands of Red Wharf Bay are a delight when the tide is down, but if the wide expanse is covered with the sunlit waters, the picture is even more lovely. Bathing, boating, reading, painting, etc., can be carried out under the pleasantest of conditions, and with an ample freedom which is not possible at the more fashionable resorts. There is a little wharf or landing place at the head of the bay, but it does not seem probable that this trading facility gave its name to the place. Authorities say that Red Wharf is a corruption of Red Warth—"warth" being an old word, similar to "traeth," the meaning in both cases being sand, strand, or the like. This seems very feasible, and will be willingly endorsed by those who have seen the beautiful colours of the shore contrasting with the varied tints of the sea and land when the rays of a June sun spreads all over the tranquil scene.

The railways of Anglesey have now been reviewed, somewhat hastily perhaps, but it will serve to bring before the notice of the reader of the RAILWAY MAGAZINE the fact

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that Anglesey is a beautiful and delightful place wherein to spend an enjoyable holiday. During the past few years the train services to the North Wales coast have been greatly extended and improved, and facilities have been given to enable travellers from all parts of the London and North Western system to reach these seaside towns with a minimum of trouble and time. Anglesey does not come within quite the same category, nevertheless the service to the island is very good. Through carriages are provided from London, Liverpool, Manchester, etc., to the stations on the Holyhead and Amlwch branches, and in the case of the Red Wharf Bay line one change only is usually necessary, namely, at Gaerwen.

for this ticket are 17s. and 24s. for a week's third or first class travel, or 24s. and 42s. for a fortnight. Should the tourist be a cyclist, he can, upon payment of 4s. for a week or 6s. for a fortnight, frank the carriage of his cycle on his railway journeys.

Possibly he may not wish to travel as far eastward as Prestatyn, and in that case ticket No. 2 would suit him better. This is precisely the same as No. 1, except that the travel on the main line comes to an end at Colwyn Bay. The fares in this case are 14s. and 24s. for the week, 20s. and 35s. for the fortnight and 3s. or 5s. for the cycle.

These Holiday Contract or Runabout Tickets allow the holder to alight from and

Photo] [*L.N.W.R.*

THE ROYAL TRAIN AT BANGOR.

To properly see the island the tourist should travel over its three railways, and to do this with the minimum of expense and maximum of convenience it is imperative that use be made of the company's Holiday Contract Tickets. Four of these tickets have been designed for visitors to North Wales, and two of these apply to Anglesey.

No. 1 is available over all the railways in the island, thence across the Britannia Bridge and along the North Wales coast from Bangor to Prestatyn. All the branches that are given off between these points are also open to the holder as far as the following limits: Carnarvon, Llanberis, Bethesda, Blaenau Festiniog, Llandudno, and Ruthin. The fares

rejoin the train at any point, and they are available for any number of journeys during the time limit for which they are issued. It is also possible to include sea trips by the Liverpool and North Wales Steamship Company's boats upon payment of an additional fee, a concession which will doubtless appeal to many visitors.

Armed with one of these tickets the tourist to Anglesey can see the whole of the island, and when he has duly covered the ground desired, can betake himself to the more extensive coast of the mainland, and view differing yet hardly more beautiful scenes than those which are found in the delightful Isle of Mona.

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CHRISTMAS CATTLE ARRIVING AT TOTTENHAM STATION.
(From the *Illustrated London News*, December 22nd, 1855.)

The Northern and Eastern Railway and its Connections. (No. 1.)

By H. H. MEIK.

TOWARDS the close of the year 1833 a scheme was projected for a railway under the title of the "Northern and Eastern Railway," which was to start from London and follow the valley of the river Lea to Ware, proceeding thence to Cambridge, Peterborough, Lincoln, and York, with a branch from Cambridge to Norwich. In the following year a company called the "Eastern Counties Railway" issued a prospectus for a line from Shoreditch to Norwich and Yarmouth *viâ* Chelmsford, Colchester and Ipswich.

Both these bills came before Parliament in the session of 1835 and in the evidence it was pointed out that the adoption of the Northern and Eastern Railway's route to York would mean a saving of 20 miles as compared with that of the London and Birmingham, Midland Counties, and York and North Midland Companies' route. Also that only two tunnels, of about 500 yards each, would be required, as against five, averaging in length three-fourths of a mile each, while the total rise for the whole distance to York would not exceed 260 ft. whereas by the other route a rise of considerably over 400 ft. would be involved. Such was the influence, however, exerted by the London and Birmingham and the other two companies, who claimed that their united undertakings provided a route amply convenient and sufficient for an ordinary passenger, that the Northern and Eastern Company's Bill was thrown out.

Not being satisfied with this reverse the promoters of the Northern and Eastern Railway reintroduced their Bill in the session of 1836, while in the meantime the London and Birmingham Company had projected a line from Northampton to Peterborough and the Midland Counties, and one from Nottingham to Lincoln. The result of all this was that the Northern and Eastern project was reduced to a line from Stratford to

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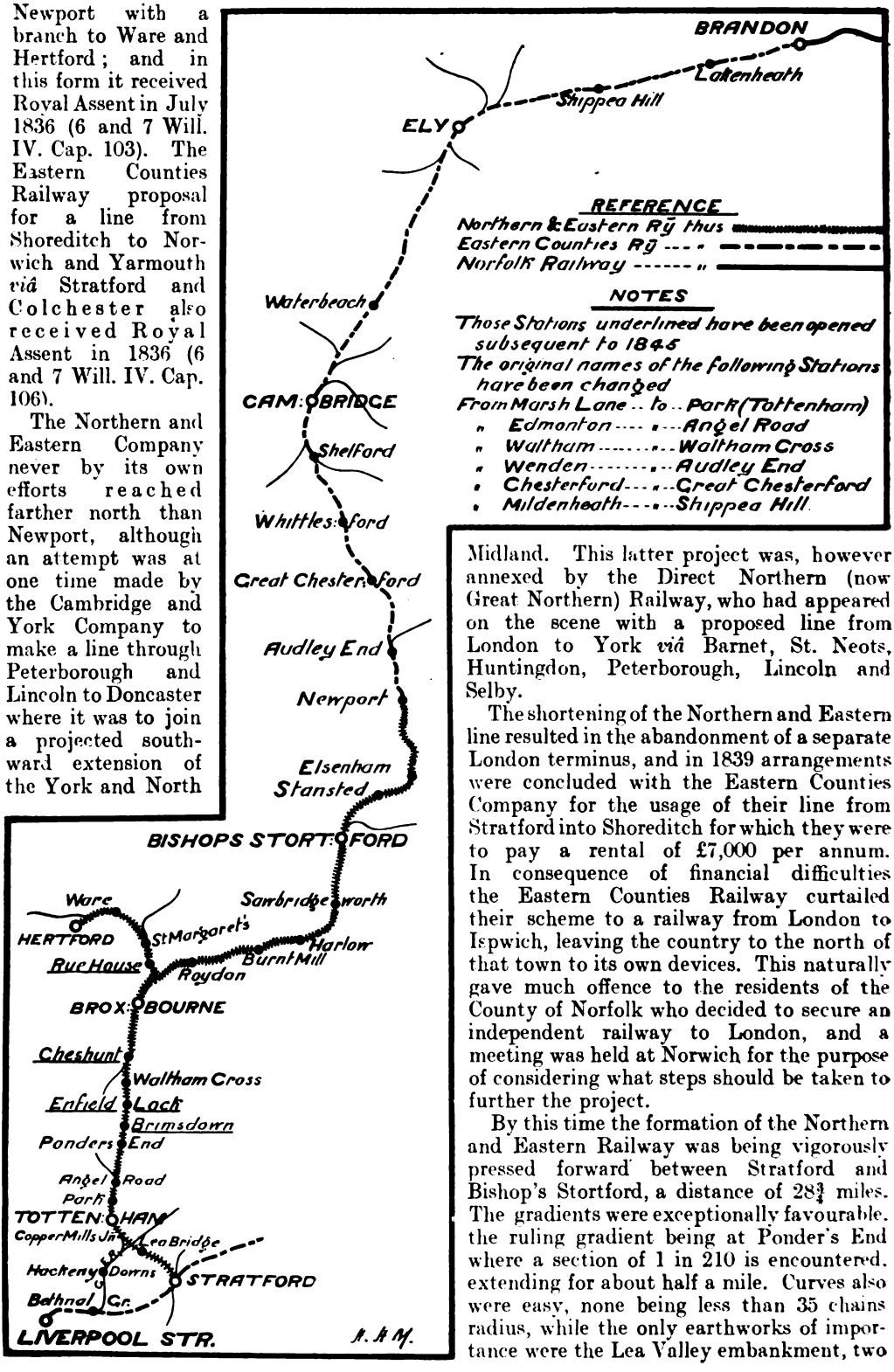
Newport with a branch to Ware and Hertford; and in this form it received Royal Assent in July 1836 (6 and 7 Will. IV. Cap. 103). The Eastern Counties Railway proposal for a line from Shoreditch to Norwich and Yarmouth *viâ* Stratford and Colchester also received Royal Assent in 1836 (6 and 7 Will. IV. Cap. 106).

The Northern and Eastern Company never by its own efforts reached farther north than Newport, although an attempt was at one time made by the Cambridge and York Company to make a line through Peterborough and Lincoln to Doncaster where it was to join a projected southward extension of the York and North Midland. This latter project was, however annexed by the Direct Northern (now Great Northern) Railway, who had appeared on the scene with a proposed line from London to York *viâ* Barnet, St. Neots, Huntingdon, Peterborough, Lincoln and Selby.



The shortening of the Northern and Eastern line resulted in the abandonment of a separate London terminus, and in 1839 arrangements were concluded with the Eastern Counties Company for the usage of their line from Stratford into Shoreditch for which they were to pay a rental of £7,000 per annum. In consequence of financial difficulties the Eastern Counties Railway curtailed their scheme to a railway from London to Ipswich, leaving the country to the north of that town to its own devices. This naturally gave much offence to the residents of the County of Norfolk who decided to secure an independent railway to London, and a meeting was held at Norwich for the purpose of considering what steps should be taken to further the project.

By this time the formation of the Northern and Eastern Railway was being vigorously pressed forward between Stratford and Bishop's Stortford, a distance of 28¾ miles. The gradients were exceptionally favourable. the ruling gradient being at Ponder's End where a section of 1 in 210 is encountered. extending for about half a mile. Curves also were easy, none being less than 35 chains radius, while the only earthworks of importance were the Lea Valley embankment, two

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miles in length, averaging about 12 ft. in height, and the Roydon Cutting, three quarters of a mile in length, with a maximum depth of 18 ft.

The line crossed the Epping Road by a brick bridge springing from cast iron plates connected together by wrought iron ties running from one abutment to the other. The span was 24 ft. 9 inches and the height 17 ft. to the springing line of the segmental arch. The river Lea navigation was crossed twice, at Tottenham and near Rye House, by girder bridges, while the Stort navigation was crossed three times between Roydon and Bishop's Stortford.

on 4th November, 1843, the line having been previously inspected by Major-General Pasley and officially reported to the Board of Trade "as in a fit state for working." The line was constructed for double track, and between Broxbourne and Ware laid between the river Lea Navigation and the New River. About a mile beyond Ware, it crosses the New River.

In February 1843, at a special meeting of the Northern and Eastern Company, it was determined to extend the line to Newport and subsequently to Cambridge, while on 25th Oct. of the same year a joint meeting of the shareholders of

CHRISTMAS TRAFFIC ON THE EASTERN COUNTIES RAILWAY.
(From the *Illustrated London News*, December 21st, 1850.)

Robert Stephenson (son of "Old George") was the engineer to the line, which was originally constructed with a gauge of 5 ft. the rails being in 12 ft. and 15 ft. lengths, set in chairs formed as usual to receive the inner side of the rail and secured by uncompressed fir keys, while the sleepers were of larch in 9 ft. lengths.

The line was opened from Stratford to Broxbourne on 15th Sept., 1840, to Harlow on 9th August, 1841, and to Bishop's Stortford on 16th May, 1842. The branch from Broxbourne Junction, $1\frac{3}{8}$ miles north of Broxbourne Station, to Ware and Hertford a distance of $5\frac{3}{4}$ miles was opened to the public

the Eastern Counties and Northern and Eastern Companies was held, at which an amalgamation of their mutual interests was agreed upon and a resolution passed empowering the Directors of the two Companies to extend the Northern and Eastern line from Newport to Cambridge. At another meeting held on 28th March, 1844, it was determined to apply to Parliament for an extension of the line from Cambridge to Ely and Lincoln, so as to take in the towns of Wisbech, Lynn and Spalding. The Eastern Counties Company agreed to the Bill for extending the line from Newport to Cambridge and Ely and from thence to

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Peterborough and Brandon, where it was to join the Norwich and Brandon Railway, the proposed branch to Lincoln being dropped in the meantime.

The two companies applied to Parliament, with the result that by Act 7 and 8 Vict. Cap. 20 (1844) the Northern and Eastern Company was leased to the Eastern Counties Company for 999 years and its share capital of £910,800 was guaranteed 5 per cent in perpetuity with surplus profits of the amalgamated Company and the right of participation in future issues.*

In the same year (1844) the amalgamated Companies obtained an act empowering them to extend the line from Newport to Cambridge, Ely, and Brandon with a branch from Ely to Peterborough *viâ* March. During that year, in order to bring both the Eastern Counties and Northern and Eastern Companies into uniformity with the other railways connecting with them at various points, the 5 ft. gauge to which they were both originally constructed, was altered to the standard 4 ft. 8½ inches gauge. This conversion took place between 5th September and 7th October, 1844, and was effected by carrying on the service on one line of rails while the other was being altered.

The Northern and Eastern line to Newport and the Eastern Counties from thence to Brandon were both pushed forward with all speed, as a public meeting had taken place at Ipswich on the subject of an extension from that place to Norwich by an independent company. Both lines were opened on 30th July, 1845, while the Ely and Peterborough branch was opened on 14th January, 1847. During this last mentioned year Stratford Station was rebuilt and opened on 1st April, and was so constructed as to be able to accommodate both the Cambridge and Colchester services.

First and second class carriages used on the Northern and Eastern line were a novelty in respect that they were mounted on six wheels, whereas all the other Companies, except of course the Broad Gauge, were using four wheeled carriages. The third class or "Stanhopes" used at this period for what were termed "wagon passengers" were open, had no seats and were divided into four compartments or pens by simply using two bars which stretched from end to end and from side to side, crossing one another in the centre of the carriage.

* The Northern and Eastern Railway was finally vested in the Great Eastern Railway on 1st July, 1902.

While the Newport and Brandon line was being pressed forward, the inhabitants of Norwich and the surrounding districts took steps to promote the formation of a separate company to connect with the Cambridge and Brandon line, as it was considered more advantage would be gained by connecting with that route than with the Eastern Union Company's Ipswich line, in that the former line would provide access at Peterborough to Northampton by the London and Birmingham Company's branch which was opened in June 1845, and also to a proposed branch of the Midland Counties Railway from their Leicester, Derby and Nottingham main line at Sipton to Peterborough *viâ* Melton Mowbray and Stamford and which was eventually opened in March 1848. A company was therefore formed and an act procured under date 10th May, 1844 entitled "The Norwich and Brandon Railway" for the construction of a railway between these two places *viâ* Wymondham and Thetford, with a short branch from Wymondham to Dereham.

The line was 37 miles 26 chains long and commenced at Thorpe Junction, 29 chains from the present Thorpe Station, on the Norwich and Yarmouth Railway hereafter referred to, and with whom an arrangement was entered into by the Norwich and Brandon Company for the use of their Norwich terminus; but, as that meant an enlargement of the station, the Norwich and Brandon Company agreed to bear a share of the cost of such enlargement and of the construction of an extension line in connection therewith, while the Norwich and Yarmouth Company agreed to subscribe £50,000 towards the completion of the Norwich and Brandon line.

A short distance from Thorpe Junction is the Trowse Swing Bridge over the river Wensum. It is an opening bridge and was originally built in 1846 and carried a single pair of rails only. It was 107 ft. over all, with two opening spans of 44 ft. clear, only one of which was navigable with a depth of 9½ ft. at H. W. M. The engineer was G. P. Bidder, C.E. and the contractor, S. M. Peto. The date marked out on the bridge was 1846. For some years after its erection the bridge was quite sufficient to accommodate the traffic, but during recent years the increase of of traffic caused the bridge with its bottle neck to become such an obstruction that the Great Eastern Company replaced it with one carrying a double line of rails. The new

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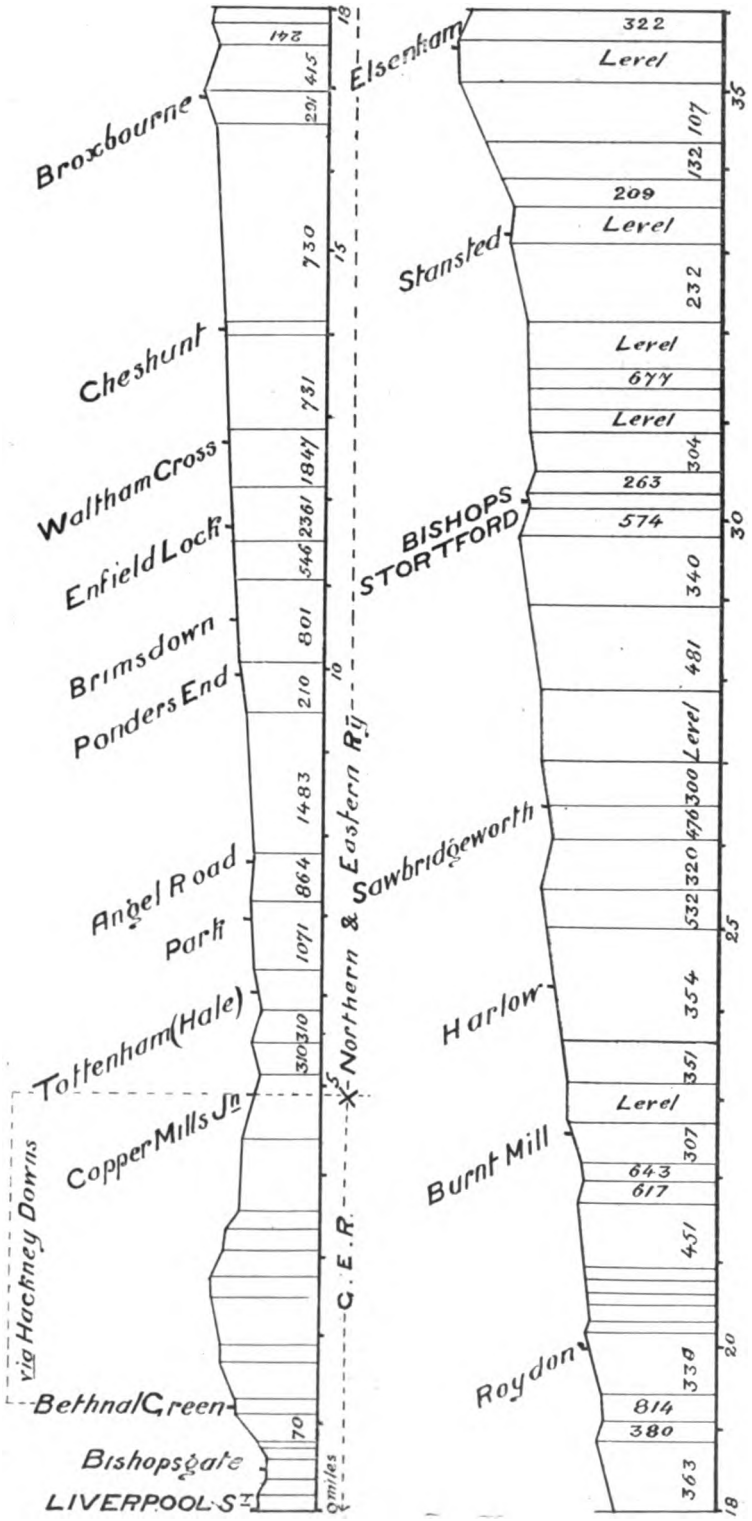

GRADIENT PROFILE: LIVERPOOL STREET TO ELSENHAM.

The distance between Bethnal Green and Copper Mills Junction *vid* Stratford, the original route, is 2¼ miles longer than the route *vid* Hackney Downs, opened June, 1872.

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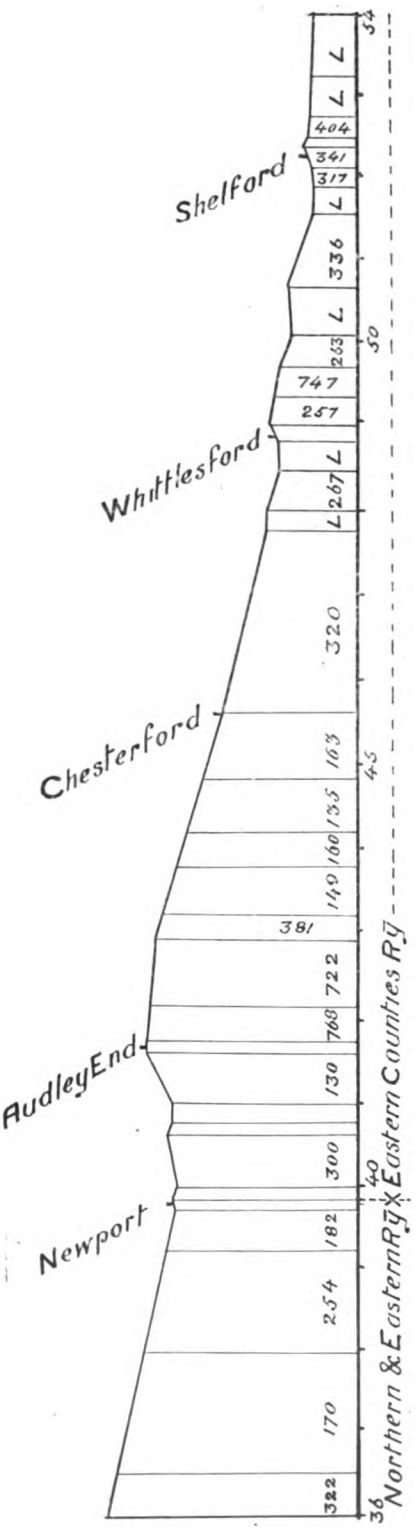

GRADIENT PROFILE: 36TH TO 54TH MILES, NORTHERN AND EASTERN AND EASTERN COUNTIES RAILWAYS.

bridge was opened on 14th August, 1904.*

After passing Trowse Station, first used about 1851, the line is crossed by the Eastern Union Railway (now G.E.R.), opened in December 1849, by means of a five-arch viaduct carrying the Eastern Union over both the river Yare and the Brandon line. At first no physical connection existed between the two railways, but later the Eastern Union Company constructed a loop 1 mile 2 chains long from Trowse Upper or Victoria Junction to Trowse Lower Junction on the Norwich and Brandon line, 8 chains short of Trowse Station. This was opened in August 1851.

Proceeding westward there was originally a station called Spinks Lane, situated about 2½ miles from Hethersett and 1¼ miles from Wymondham, but it appears to have been closed some time prior to March 1866 as it does not appear in the Company's Time Table for that month. Hethersett also appears to have been closed for a time; it appears in the Time Sheet for September 1845 and also in the present Time Table, but is not shown in that for March 1866.

At Wymondham, 9⅞ miles from Thorpe Junction, a branch diverges to Dereham, 11⅜ miles. Roudham Junction only came into existence on the opening of a small line called the Thetford and Watton Railway, incorporated on 16th July, 1866, for a line from Roudham to Watton, with running power's from Roudham to Thetford, where another small line branched off called the Thetford and Bury St. Edmunds Railway, at first part of the Newmarket—Bury extension line (originally incorporated as the Newmarket and Chesterford Railway), and was opened in April 1854. This line was originally worked by the Thetford and Watton Company and both companies were leased to the Great Eastern Railway on 1st March, 1880. At Brandon, 7¼ miles from Thetford, the line joins the Eastern Counties Railway from Ely and Cambridge.

Gradients between Norwich and Brandon are of an undulating character and for a main line of the present day may be considered fairly easy, the ruling gradient being 1 in 101 for about half a mile just west of Hethersett, while the next steepest gradient is 1 in 129 for two miles; otherwise there are no gradients under 1 in 190.

The line from Trowse to Brandon, together with the Dereham branch, was opened

* A description of this bridge appeared in the RAILWAY MAGAZINE for October, 1905 (Vol. 17, p. 316).

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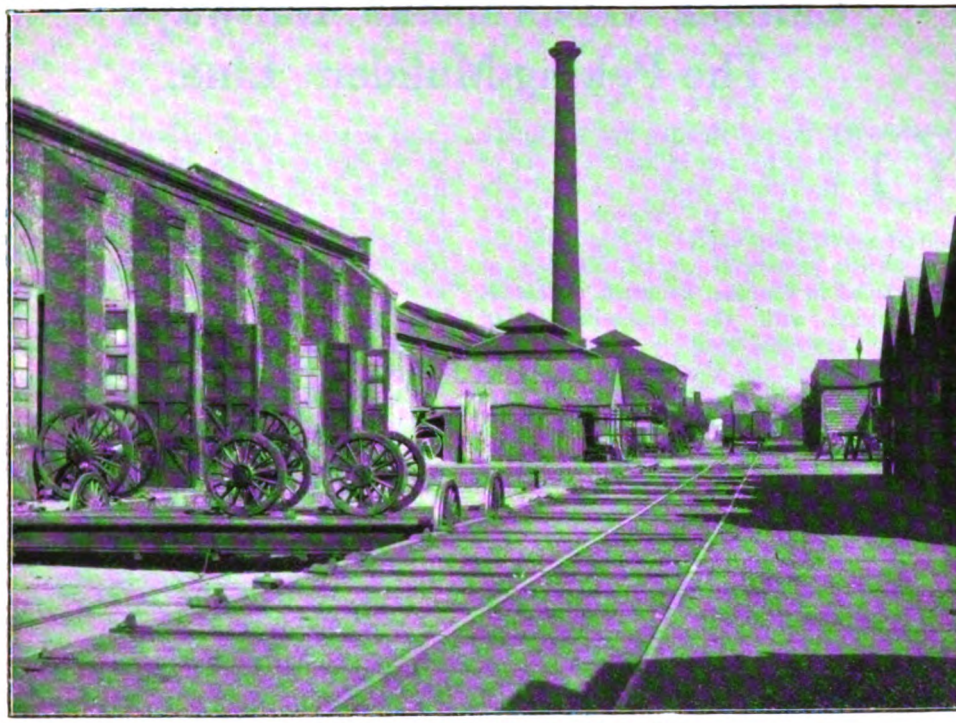

NORWICH LOCOMOTIVE WORKSHOPS.

on 30th July, 1845, the same day as the Eastern Counties line from Newport to Brandon. *

On the completion of the Trowse Swing Bridge, in 1846, the line was opened to Thorpe Junction and trains commenced working in and out of Thorpe Station. On the day previous to the opening the directors of the Eastern Counties Company and friends—300 in all—travelled down from Shoreditch to Ely by a train drawn by two locomotives, and consisting of first class carriages, and open carriages at the rear conveying the band of the Coldstream Guards. At Bishop's Stortford the horn of the solitary remaining Cambridge Coach served to emphasize the fact that "the old order changeth, giving place unto the new." The train reached Ely at 12.15 p.m. where it was met by a train from Norwich bringing the Norfolk Railway Directors and friends, to the number of 150. Both trains were then joined together and returned to Cambridge, where the usual banquet was held.

The Bill for the Norwich and Yarmouth Railway received Royal Assent on 18th June, 1842, (5 and 6 Vict. Cap. 82). The line was originally formed for a single line of rails 20 miles in length, of the standard gauge, following the course of the river Yare, by way of Reedham Junction, the whole way to Yarmouth (Vauxhall station). All the stations were constructed when the line was opened, except Whitlingham which was only built when the North Walsham line was brought into use in October 1874. The line is of a level character, but owing to the necessity of obtaining a Drainage Act in order to deal with the marsh land along the route of the line the completion and opening of the line did not take place until 1st March, 1844. The opening ceremony was marked with the usual civic banquet and post-prandial toasts.

The original Norwich Station, afterwards called "Thorpe" to distinguish it from the "Victoria" station of the Eastern Union Company, was erected in 1844 and, as before stated, was enlarged to accommodate the Norwich and Brandon Company's trains on the opening of their line. It continued to be a passenger station until 1886 when in order to meet the increasing traffic requirements the present Thorpe station was erected close beside the former station which then became a goods depot. The low roof, old wooden platforms and turntables as originally erected, are still to be observed.

(*To be continued.*)

* Before this occurred, however, the Norwich and Brandon and Norwich and Yarmouth Railways had been amalgamated under the name of "the Norfolk Railway."

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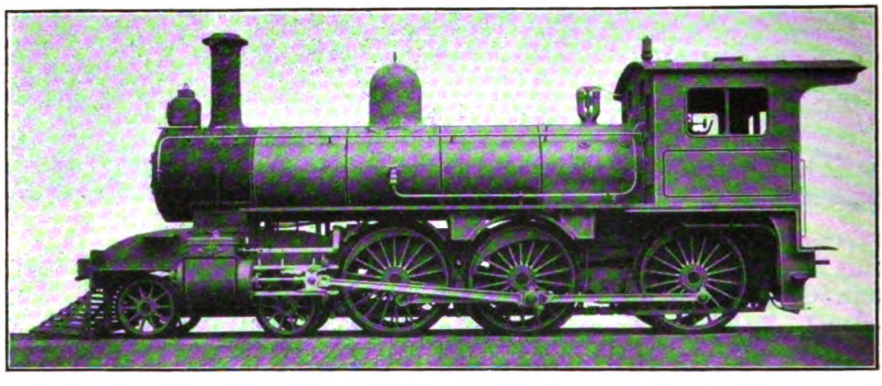
Chinese Government Railways : The Peking-Mukden Line.

THE Peking-Mukden line is China's great pioneer railway, and one of the trunk lines of the railway world. It connects China's central government capital, Peking, with the Manchurian provincial capital, Mukden, or as is styled in Chinese, Fengtien. Thereat it connects with the Trans-Euro-Asian Railway systems, and is thus a link between Peking and the various European capitals. Over its tracks is made the final portion of the 11 days' rail journey from London to Peking.

For many years previous to the birth of this line various efforts were made to launch railway enterprise in China. Each and all met with insurmountable difficulties. A short narrow gauge 2 ft. 6 in. track was laid down, and its first section opened for traffic from Woosung, on the Yang Tse Kiang, towards Shanghai, Central China, in 1877. This track was shortly afterwards taken up, in order to allay strong opposition. These events, however, caused thoughtful inquiry among the Progressives. After this time, questions of improved methods for mining and transport were widely considered. The Kaiping coal fields, situate near the sea in Northern Chihli, North China, were being opened under H. E. Li Hung Chang, and Mr. Tong King Sing. These gentlemen were favourably inclined towards improved methods of transport. H. E. Li Hung Chang was at that time Viceroy of Chihli Province, and was a man wielding great influence in the official world of China. A canal was dug to the nearest possible point to the new coal pits, but a nine-mile gap from the head of the canal to the mines remained to be filled. The Kaiping Tramway was arranged to span this area, and animal traction was announced. The word "railway" did not appear, but the Kaiping Tramway was built on the standard gauge under these two progressive men, and opened quietly 1880-1881.

Mr. C. W. Kinder had been appointed engineer to carry out the work. A locomotive was built locally from odd parts of a portable engine mounted on a frame of iron channels and plates, and set up on some old engine wheels. When completed it was christened "The Rocket of China," and placed in service on the tramway. A couple of locomotives were then imported, and gradually the general community reconciled itself to steam traction. Railways in China had thus become an accomplished fact under the term "Tramway," nine miles being in operation. In 1886 extension permits were obtained. A new concern called The China Railway Company was formed to take over the Kaiping Tramway and to prolong it. Extensions were carried southward to the seaport of Tongku, thence westward to Tientsin, the provincial capital, and northward through the coal area to Kuyeh in 1890. Available capital was now at its limit, but 100 miles of line were open. Sanction to extend to Shanhaikwan, on the Manchurian Province border, was obtained, and carried out as a provincial government undertaking in 1891-1894. A



4-6-0 LOCOMOTIVE : BUILT BY THE NORTH BRITISH LOCOMOTIVE CO., LTD.
The tenders for these engines were constructed in China.

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more pretentious scheme of extension through Southern Manchuria was next launched, with an extension westward from Tientsin to Peking.

While these works were in hand the China-Japanese war broke out, and caused a stoppage in construction for awhile, and then the railway for the first time carried troops on active service. H. E. Hu Yu Mei was then appointed Administrator, and arrangements were made with the Hongkong way) had also reached Newchuang in 1900. Thus Peking became linked up with Europe just prior to the Boxer upheaval. During these troubles sections of the line were considerably damaged. The Manchurian portion came into the hands of the Russian military. That in Chihli Province was seized by various nations of the allied force, a portion of it suffering severely. The Russians retained the Manchurian section until 1902. By various diplomatic

YEH KUNG CHO.
Vice-minister and Director-General of Railways.

LI TSOI CHEE.
Director: Chinese Government Railways, Peking-Mukden Line.

and Shanghai Bank for financial assistance. These led to the Loan Agreement of 1898, under which £2,300,000 was advanced, and the Imperial Railways of North China came into being. Extensions were by 1900 carried northward to Newchuang, the Manchurian Treaty Port, and southward from Peking to Pao Ting Fu, the latter section (90 miles) being later sold to the Peking Hankou Railway Concession. The Chinese Eastern Railway (Manchurian extension of the Russian Trans-Siberian Rail-

arrangements the Chihli section passed successively to Russian, German and finally to British military control, until 1902, when the whole line, British and Russian sections, were restored to the Chinese flag. Extensions then took place northward, and finally to Mukden, thereby making the present and shorter route to and from Europe. To complete the latter, a 36-mile Japanese military 3 ft. 6 in. gauge branch line was purchased and converted to the standard gauge.

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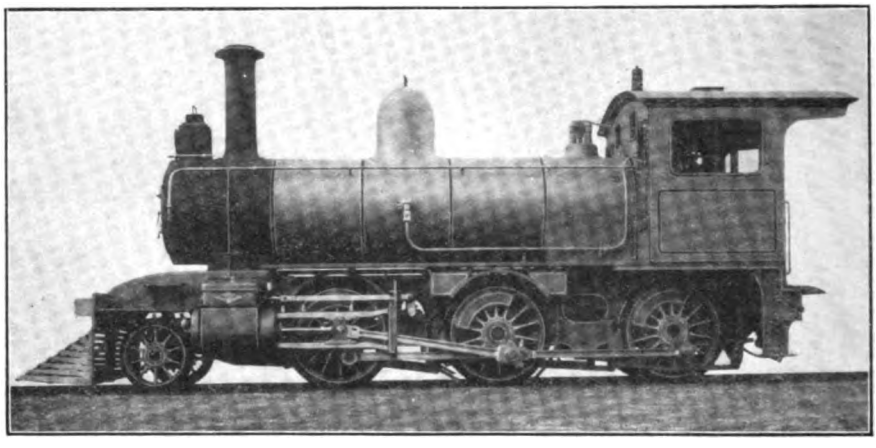
During the early years of the system, when open mileage was limited, the traffic was very small, but coal and grain were developing. After the extensions into Manchuria and to Peking, traffic grew more rapidly. Organisation was steadily improved, and constant efforts were made to divert trade from the old road and river routes to the new rail route. A long fight took place between the old and new routes and methods. The railway steadily obtained the leading position, passengers, grain, rice, timber, wool, texiles, coal, salt, and tea being each in turn diverted, The old routes and their distributing centres steadily declined in business, while the railway route and its new centres increased in importance. have gradually advanced again to $13,183,000 in 1912 as the result of constant ordinary development. Passenger traffic—first, second and third classes being carried—totalled 271,554,996 passenger miles in 1912, while during the same year the goods ton mileage was 299,419,493, making roundly 570,000,000 passenger and goods ton miles. The coal output of the Kailan Mining Company, situate on the system in Kaiping district, has grown to two million tons annually and still increasing.

Fittingly, at Tangshan—the starting point from which the railways of China began—there have grown up China's biggest and best railway workshops. These have been evolved year by year with the steady growth



2-6-0 LOCOMOTIVE: BUILT BY THE NORTH BRITISH LOCOMOTIVE CO., LTD. Cylinders, 17 in. by 24 in.; coupled wheels, 4 ft. 6 in. diameter; steam pressure, 180 lbs per sq. in.; heating surface, 1213 sq. ft.; grate area, 20·2 sq. ft.; adhesion weight, 39 tons 2 cwt.; weight of engine in working order, 86 tons 6 cwt. The tenders for these engines were built in China.

After the rendition of the railway to China, this development was continued with the aid of a competent staff of assistants. Engine power and rolling stock, though constantly increased, was yearly taxed to the limit, and at times could not handle all that offered. The Russo-Japanese war caused practically a 100 per cent. increase in traffic in the course of a few months, 130 miles of the railway being in proximity to the war zone. Neutral passengers and valuable cargo were first fleeing therefrom, and later heavy imports of foodstuffs and necessaries were necessary to fill shortages. During this period—1905 and 1906—traffic receipts jumped up to $12,000,000 odd annually. They eased off after the war effects, and in 1907 passed to slightly below $10,000,000, from which they

of the railway. They began by partly assembling and partly building goods and passenger cars and erecting locomotives. To-day they build their own locomotives and cars, with the exception of special parts, from imported raw materials, and, in addition, build considerably for other railways in China. These shops give employment to about 3,000 men. There is also a large repairs shop at Kou Pang Tzu, Manchuria, where local car and locomotive repairs of all kinds are executed.

The earlier locomotives, which were mainly supplied by the North British Locomotive Co. Ltd., gave complete satisfaction. There were also a few Baldwins and some Belgian engines placed on the system. The local works have, however, been able to turn out

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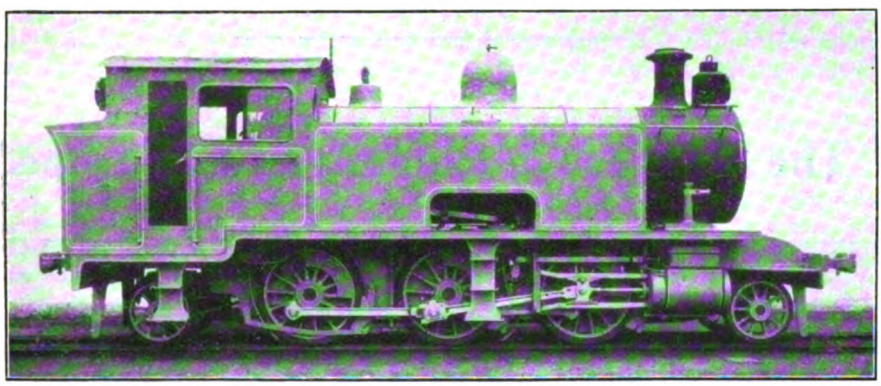
all the locomotives required in more recent years. First and second-class trains *de luxe*, comprising "sleepers," day cars, and dining cars for each class, have also been produced by local works. These cars maintain connections between Peking and Mukden, with the International Wagon Lits Company's Tran-Siberian expresses. They have been fitted with Westinghouse steam heat system and electric light, with electric fans throughout for use during the summer. The temperature in the districts served varies between 100° Fahr. in summer and 25° below zero Fahr. in winter. The locomotive department and shops are controlled by Mr. F. A. Jamieson, Superintendent, with Mr. Fripp as Works Manager, and a competent staff.

In 1907, the Tangshan College was formed for the training of students in railway construction, mechanical, electrical and mining engineering. In the preparatory department accommodation was provided for 150 students, and full accommodation was later established for continuation in the college term. For educational purposes, two fine large halls, a central lecture room, and an engineering laboratory were opened. The equipment of the latter, briefly classified, is as follows:—(1), heat engines and laboratory; (2), mechanical and hydraulic laboratory; (3), electrical laboratory; (4), engineering workshops; (5), physical laboratory; (6), chemical and geographical laboratory; (7), demonstration apparatus for civil engineering and surveying. The students' roll has been full from the inception.

The railway has its own bridge works, situate at Shan Hai Kuan, alongside the Great Wall of China, where the railway passes through the wall into Manchuria. Here girders of all types are constructed from the raw material and erected at the bridge sites on the line, as also on other lines in China. These girders have given entire satisfaction, many of them having been in service over 20 years. The line being mainly over plain country, bridging small and large streams has been the principal engineering feature, the longest bridge being over Ta Ling river, 2,862 ft., comprising 27 spans of 106 ft. each. Liao Ho bridge is 2,200 ft. There are 500 odd smaller bridges of various lengths. Some of the river beds have steep gradients. Throughout the greater portion of the year they are almost dry, but in the rainy seasons become torrents. The steepest track gradient on the line is 1 in 110, and, consequently the engines have to be capable of hauling heavy loads. On the flatter sections of the line the gross weight of goods trains run up to loads of 1,250 tons. The Chief Engineer is Mr. D. P. Ricketts, with Mr. A. G. Cox deputy, and a staff of highly qualified engineers capable of doing any work offering.



2-6-2 TANK ENGINE: BUILT BY THE NORTH BRITISH LOCOMOTIVE CO., LTD.
Cylinders, 17 in. by 24 in.; coupled wheels, 4 ft. 6 in. diameter; steam pressure, 180 lbs. per sq. in.; heating surface, 1,100 sq. ft.; grate area, 20 sq. ft.; adhesion weight, 41 tons 15 cwt.; weight in working order, 61 tons 17 cwt.

In 1907 the Board of Communications was established by the Emperor at Peking. All matters relating to railways, posts, telegraphs and telephones, roads, canals, and shipping were to be dealt with by this Board. Previously the several provinces dealt more or less separately with their railways and projects. After the establishment of the Board, more centralisation and co-ordination of management was obtained, leading in several directions to reorganisation. Steady

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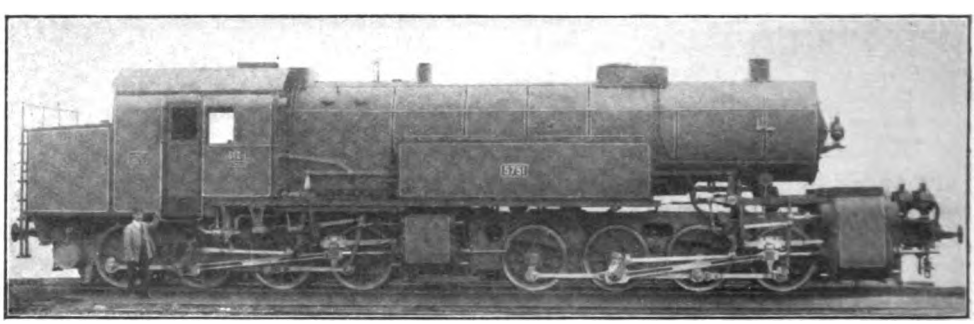
advancement is being made with co-operation between the various railway systems of the country. The Board of Communications is also the connecting link between all the railway systems and the Government. Its President and Vice-President are members of the Cabinet and of the Executive Government, the President's portfolio ranking as one of the most important in the Central Government.

Among the names of past Chinese Directors-General and Directors of the Peking-Mukden Railway occur many who have since filled the most important political posts in the country—H.E. Yuan Shih Kai, now President of the Chinese Republic; H.E. Tang Shao Yi, late Premier of China; H.E. Wu Ting Fang, late Minister to Washington; H.E. Li Hung Chang, late Viceroy and Grand Councillor; H.E. Shih Shao Chi, late Cabinet Minister; H.E. Liang Shih Yi, Secretary and Adviser to President Yuan; and H.E. Yeh Kung Cho, Taotais Liang Ming Ting, Chou Chang Ling, Loo E. Tong, Li Tsoi Chee. The position has invariably proved a stepping stone to still higher offices. This is as it should be, and affords proof of the great extent to which modern business methods are exerting and influencing modern China.

The Peking-Mukden Railway's ten years' statistical barometer speaks for itself regarding the soundness of the enterprise, which ranks as one of the best paying railways of the world.

"The Largest Locomotive in Europe."



These engines, recently built by the firm of J. A. Maffei, of Munich, for banking service on the Bavarian State Railways, are claimed to be the largest in Europe, if the tender is not included in estimating the weights of main line engines with which comparison may be made. They are, we believe, the first double eight-coupled engines in European practice, the highest developments of the Mallet type being the 0–6–6–0 and 2–6–6–0 wheel arrangements. The total length over buffers is 57 ft. 7 in. Weight in working order is 122·5 tons, and this is distributed over two groups of eight-coupled driving wheels. The latter are 3 ft. 11⅞ in. in diameter, the wheelbase of each group being 14 ft. 9 in. The second axle of each group has a lateral play of ⅝ in., such as to allow the engine to negotiate curves of 590 ft. radius; the total wheelbase is 40 ft. Cylinders are 20½ in. and 31½ in. diameter, with strokes of 25 $\frac{5}{16}$ in. Grate area is 45·5 sq. ft. The working pressure is 212 lb. per sq. in. A Schmidt superheater of 590 sq. ft. heating surface supplies a steam temperature of 570° F. The total heating surface is 3,038 sq. ft. The centre line of the boiler is placed 9 ft. 8½ in. above rails, the diameter of the boiler barrel being 5 ft. 9½ in., and its length 16 ft. 8½ in. The smoke-box is 9 ft. 6 in. long, diameter 5 ft. 11 in. A spark arrester is provided in the smoke-box. The blastpipe is adjustable. The commodious cab has steel sheets and windows on all sides in order to protect the engineman from the influence of the weather.

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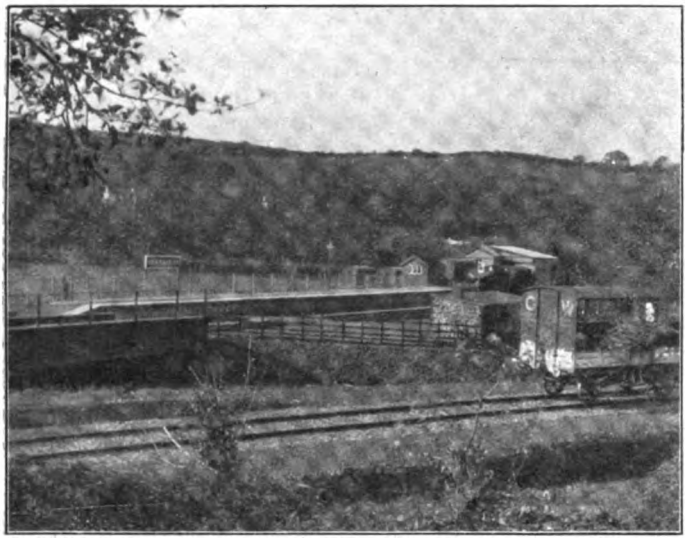

ABERAYRON STATION.

The Lampeter and Aberayron Railway.

By
ALFRED W. ARTHURTON.

A GLANCE at a railway map of England and Wales produces the impression that there are now very few districts which are not in some way served by one or more railways. And yet, in many counties, there are still numerous villages, and even good-sized towns, which are so far removed from a railway that the majority of their inhabitants rarely, if ever, travel by rail, the difficulty of getting to and from the nearest station presenting a barrier which only those who must travel, or who are able to afford the expenditure of time and money which every journey involves, can surmount. This is particularly so in the western counties of Wales, where many districts are so remote from the railway that they have perforce remained undeveloped solely owing to lack of transport facilities.

The opening, in 1911, of the railway to Aberayron, a town by no means unimportant on the shores of Cardigan Bay, marked the completion of an undertaking which has for the last 30 years been in progress. Many attempts had been made to place Aberayron in direct rail communication with the outer world, but all were doomed to failure, and only the persistent efforts of a small body of public-spirited men, chief among whom was Mr. J. C. Harford (the present chairman of the company), brought the project through many vicissitudes to a successful issue. In view of the fact that the Great Western Company works and maintains the new line, it is interesting to note that Mr. Harford's father was prominently concerned in the earliest conception of their railway in the West of England, having joined with other leading citizens of Bristol in the promotion of the Bristol and London Railway. The schemes for the construction of a line to Aberayron, which had been put forward from time to time, had fallen through mainly for lack of capital, and it was not until the passing of the Light Railways Act of 1896 that a move was made towards the realisation of the long-wished-for railway. For some time it was doubtful whether the line, if made at all, would begin at Aberystwyth or at Lampeter.

In 1898 the Vale of Rheidol Railway Company, which had built a line from Aberystwyth to the Devil's Bridge, obtained an order authorising them to construct a railway in connection with the latter to Aberayron. This was to be 16 miles in length, commencing by a junction with the Devil's Bridge Railway at Aberystwyth, and having a gauge of 2 ft. The Cardiganshire County Council agreed to make an advance of £18,000 towards the scheme, but it was not found possible to raise the remaining capital, and the project for the time had to be abandoned. Meanwhile efforts were being made to promote a railway from Llandilo to Aberayron or from Lampeter to Aberayron, and in 1903 it was decided to apply for an order for the construction of the latter, the cost, with rolling stock and complete equipment, being estimated at £110,000. Early in the following year two Light Railway Commissioners held an enquiry at Lampeter, and reported in favour

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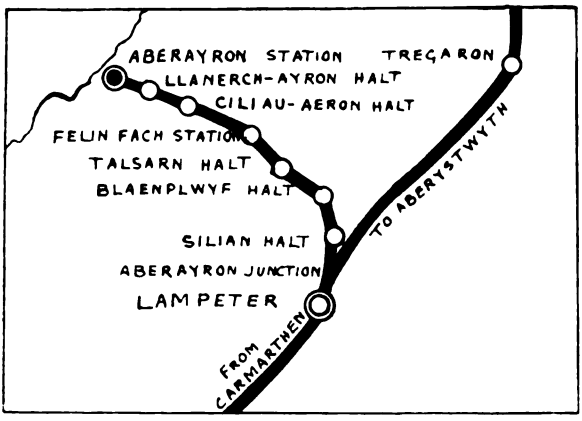

of the issue of an order. There was, however, a diversity of opinion as to the route to be followed, and some difficulty was experienced in regard to the required grants. Proposals were made to include in the scheme an extension to New Quay, and a rival project in conjunction with the Cambrian Company from Llanrhystyd Road station was also put forward. Negotiations between the County Council and the promoters of the Lampeter and Aberayron scheme dragged on till 1908, when satisfactory arrangements having been concluded, the contract for making the line was let and the work commenced. Meantime, the Great Western Company—which had in 1906 entered into an arrangement to work the Manchester and Milford Railway—had attempted to solve the problem of establishing regular communication with Aberayron by putting on a service of road motor-'buses from Lampeter. The route soon became popular—possibly by reason of the run of an hour and a half through some of the prettiest scenery in Cardiganshire—and at a later date a similar service of cars was instituted along the coast between Aberystwyth and Aberayron, thus providing an additional line of communication with the hitherto little-known watering-place.

The new line leaves the Manchester and Milford section of the Great Western Railway about 1¼ miles north of Lampeter, the latter station being used as the starting point. From the junction at Glandenys the line crosses the Dulas and Denys streams, and passes through Coedparc. It crosses the Lampeter and Derry Ormond road at Silian, the first halt, and then ascends by easy curves and gradients the Denys Valley to Blaenplwyf Halt, where it attains the highest point above sea-level. A descent is made into the Aeron Valley by means of the steep embankments carrying the line over the wide and deep ravines at Cwmcafn and Hendrelas, the latter being over 80 ft. deep. The next halt is at Talsarn, beyond which the line makes a long curve to the west, and reaches level ground near the halfway station at Felin Fach. This station serves the historic hamlet of Mydroilyn and a group of other villages. The line now touches the main road from Lampeter to Aberayron, following it closely throughout the Aeron Valley, the river Aeron being on one side and the road on the other. About 2½ miles from Felin Fach, Ciliau-Aeron Halt, which serves Cilie Aeron and Llanaeron, is reached. Here, as at Talsarn, "station to station" traffic is dealt with at the sidings provided, and passenger and parcels traffic at the halt itself. The arched bridges at Llanaeron over the Aeron and Mydr rivers, are good examples of modern concrete structures. Before reaching these, however, Llanerch-Ayron, another halt, is passed, and beyond the rivers the town of Aberayron itself comes into view. The terminus is situate on the west bank of the Aeron river, 12 miles from the junction near Lampeter.

LAMPETER STATION.

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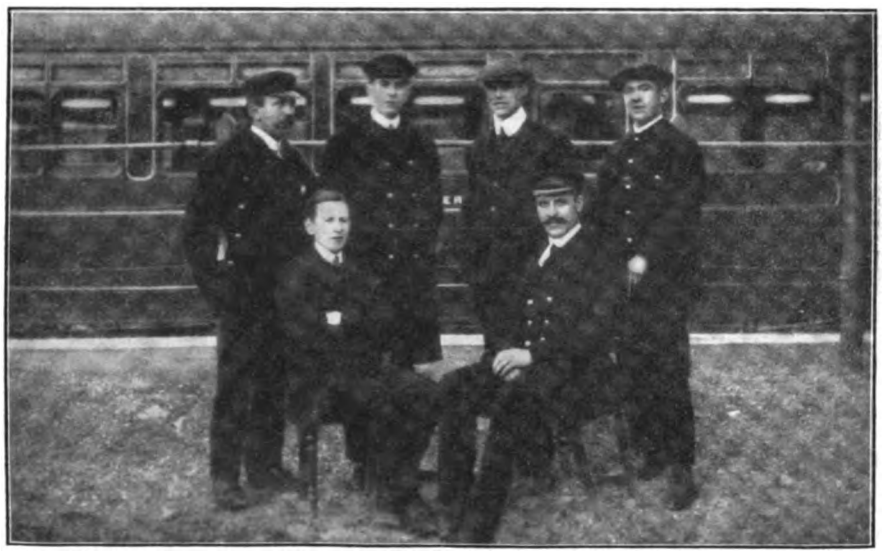
Throughout the route followed by the new railway the scenery is very picturesque, and from the well-wooded uplands about Blaenplwyf to the rich pasture lands of the Aeron Valley a succession of charming views unfold. The streams running through the valley afford good sport for the angler, the Aeron itself teeming with salmon, sewin, and trout, while at Aberayron mackerel, whiting and gurnet may be taken with lines in the bay, or bass, mullet and conger from the pier head. Although composed mostly of pebbles, the beach here has stretches of hard sand, and affords very safe bathing, while boating in the bay is a delightful pastime. The Aeron Valley is unsurpassed for its groves and woodlands, and there is a great variety of charming walks, among which may be mentioned that through Hengeraint Woods. The new line has reduced the cost of conveying coal from Lampeter to Aberayron from 10s. to 2s. 4d. per ton. The places served by the railway have considerable historic interest. Lampeter was a place of importance in Norman days, while at the present time the St. David's University College and College School have made it an important educational centre. Roman and British remains are scattered throughout the whole of the Aeron Valley. Llanlear, in the neighbourhood of Talsarn, was formerly a Cistercian nunnery, and near the halfway station at Felin Fach are the remains of the ancient castle of Mydroilyn, as well as the mansion of Brynog with its beautiful park. The mansion at Llanaeron, near Cilian Aeron halt, contains within its park a picturesque church dedicated to St. Non, mother of St. David, the patron saint of Wales. Many years ago the Government offered an immense sum for the oak trees of the Hengeraint Woods for the purpose of building warships, the then wooden walls of old England.

Train services are provided between Lampeter and Aberayron by means of a rail auto-car, one class only. This consists of a small locomotive with a trailer car attached. The engine is of the $\frac{0\text{-}4\text{-}2}{T}$ type, fitted with additional regulator gear, enabling it to be driven either from the footplate or from the driver's compartment in the car Standard connections are used, and electrical communication is provided from the driver's compartment on the trailer to the engine. The appearance of the combination is very effective, the engines having been painted brown to match the cars. Several of these auto-trains are in use in various parts of the Great Western system. Every day there are four trains in each direction, the 12 miles between Lampeter and Aberayron being covered in about 50 minutes. Through connections are established with the 9.15 p.m., 1 a.m., 8.45 a.m., and 11.30 a.m. from Paddington.



THE STAFF AT ABERAYRON STATION.

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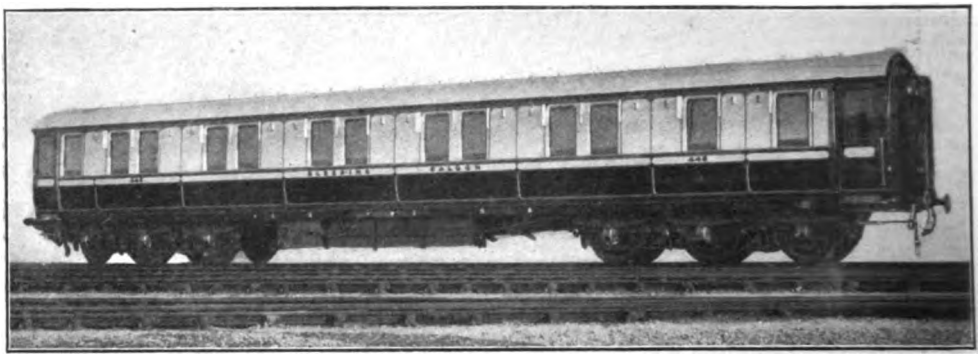
New Sleeping Saloons: West Coast Joint Stock.

FOR some time the policy has been actively adopted by the West Coast railways of adding new vehicles, representing the most advanced practice in railway carriage construction, for use on principal services, and a series of splendid sleeping saloons have just been completed at the Wolverton Carriage Works of the London and North Western Railway for West Coast Joint traffic between England and Scotland. They have been built to the designs of Mr. H. D. Earl, Carriage Superintendent, and



NEW SLEEPING SALOON: WEST COAST JOINT STOCK.

are the longest vehicles yet built at Wolverton. Principal dimensions are: Length over buffers, 72 ft.; length over body, 68 ft.; width at waist, 9 ft.; width under cornice, 8 ft. 9 in.; height of carriage body in centre, 8 ft. 5 in.; height from carriage bottom to top of side cornice, 6 ft. 7¾ in.; height from rail level to top of roof, 12 ft. 5½ in.; and height from rail level to top of side cornice, 10 ft. 8¼ in.

Each vehicle is mounted on two six-wheeled bogies, and is supported on an all-steel underframe. Special attention has been given to the springing and riding. Shock absorbers are fixed to each end of the laminated springs, and large concentric springs support the underframe and body. To reduce vibration and noise to a minimum india-rubber body blocks are fixed between the body and underframe and hair is inserted between the double floors.

The apparatus for the vacuum and the Westinghouse brakes, the electric lighting equipment and the "Wolverton" steam heating apparatus are suspended on the underframe. In each saloon are 10 berths, one smoking compartment convertible to a berth, a lavatory, an attendant's compartment, and a vestibule at each end. Between some of the berths communicating doors are placed so that, if necessary, a single berth can be converted to a double one. Entrance is through the doors leading into the vestibules.

The structural framing of the body is partly oak and partly teak. The outside between the vestibules is designed after the well-known saloon style of the London and North Western Railway Company. It is panelled with canvassed and blocked "Honduras" mahogany, and its finishing and colouring is in conformity with the usual practice. A departure has been made in the design of the entrance of the vestibules, the doors opening outwards, which gives a more roomy entrance and space is gained in the vestibule.

Interior finishing of the berths, smoking compartment, and corridor consists of mahogany framing, Italian walnut dado panels, and beautifully figured veneered mahogany upper panels. The dado panels are surrounded by wide mahogany bolection mouldings, and the upper panels by narrow mahogany bolection mouldings. The ceilings and everywhere above the cornice moulding throughout the saloon, except in the attendant's compartment, are finished with three-ply birch painted white. The bed in each sleeping compartment is supported on a spring mattress. On this is placed a spring mattress, and then a hair-stuffed mattress. The bedding consists of the usual sheets and

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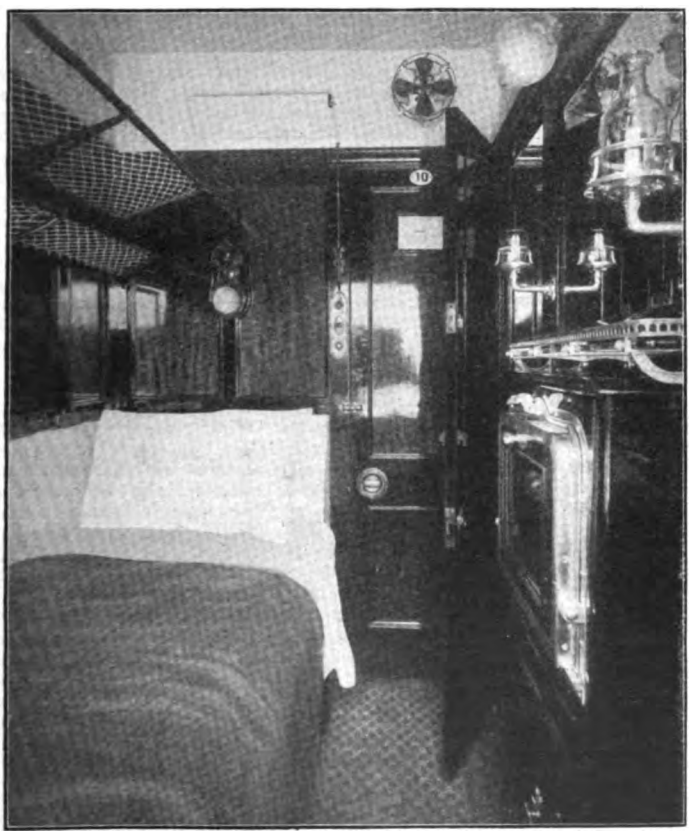
pillows and the whole is covered with a "Jaeger" blanket. The trimming round the bed has been reduced to a minimum and consists of a layer of hygienic felt covered with a light-coloured moquette. Under the bed no trimming whatever is used, but finished with plain wood panels, and all angles are coved. This finish prevents dirt from accumulating and can be easily cleaned.

Above each bed and the seat in the smoking compartment is fixed a white corded rack supported on brass brackets and with rods finished ozidised copper. These racks have been designed to give a maximum storage for light articles such as umbrellas and wearing apparel. In each berth and in the smoking compartment is fixed a self-contained mahogany lavatory cabinet. The bottom cupboard is designed for a *pot-de-chambre*, and sanitary conditions are fully met in its construction. In the upper part of the cabinet are fixed a folding table and a folding wash-basin, hot water and cold water taps, and a soap-dish. The whole of the fittings are silver-plated.

Above the cabinet a mirror, a brush and comb rack, a water bottle and a glass holder, and an electric lamp are fixed. The metal fittings are beautifully designed and finished in silver-plate. On one side of the cabinet in the berths, and on both sides in the smoking compartment, folding mahogany tables are fitted for the accommodation of tea trays. In the coach side of the berths and smoking compartment is arranged a drop-light with perforated sheet copper in the tops. One of the new features is a rolling shutter arranged over these lights. When up, this is hidden behind a hood. When the shutter is down, absolute privacy and general appearance of warmth and cosiness are obtained. Moreover, the shutter does away with blinds and curtains and excludes all draught. A heater is fixed under the foot of each bed and is arranged so that the passenger can control the warmth of the berth without rising from bed.

Berths are ventilated with hemispherical vents in the roof, extractor vents on the side of the coach, drop-lights with deflectors outside, zinc grills fixed in the corridor partition above the cornice, and by small electrically-driven fans. Each berth is illuminated by a lamp over the mirror and one over the head of the bed. The latter is fitted with a holophane shade so that it may be used as an ordinary lamp, and a small blue glass encloses a night lamp. The switches controlling the lamps are fixed near the head of the bed, so that a passenger can regulate the lighting. The floors of the berths and smoking compartment are covered with inlaid linoleum with loose rugs on top.



INTERIOR OF SLEEPING COMPARTMENT.

The seat in the smoking compartment is designed so that its normal appearance is like that of a first-class carriage seat. It is trimmed with "saladin" moquette. The seat frame is constructed to draw out so that a bed similar to those in the berths can be made on the top of the ordinary seat if necessary. Above

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the seat a mirror and two photo views are fixed, and in addition to the seat mentioned is a loose bent-wood chair.

Illumination is obtained from corner lamps over the seat, a ceiling lamp, and one over the mirror. The switches controlling these lights are arranged so that a passenger can easily reach them when in bed.

The general lavatory is next to a vestibule, and entrance to it is through the latter. The finishing consists of mahogany rails, between which is fixed vee-jointed fumed oak lagging. The floor is covered with mosaics surrounded by a coved tiled skirting. The wash-basin has a St. Anne's marble top and skirting. The w.c. is water sealed, of white porcelain, and is fitted with mahogany seat and lid. The attendant's compartment is at the opposite end to the lavatory. Its walls and ceiling are finished with fumed oak lagging. Fittings include boiler, urn, cup and saucer cupboard, linen cupboard, case for trays, soda-water locker, folding table, and a camp stool. The cupboards are fumed oak. In the corridor all the windows drop and a postal box and fire-extincteur are placed in convenient positions. The finishing of the vestibule consists of mahogany framing, dado of vee-jointed fumed oak lagging, and mahogany upper panels with narrow mahogany bolection mouldings. In the floor is a fibre mat in a zinc tray held in position by a brass chequered plate surrounded by a linoleum border.

Railway Literature.

RAILWAY YEAR BOOK. [Price 2s. 6d. net. Cloth. Post free in the United Kingdom, 2s. 10d.; abroad, 3s. 365 pages, 37 maps. The Railway Publishing Co., Ltd., 30, Fetter Lane, London, E.C.] The new edition for 1914, the 17th annual volume, is now published, and is characterised by many improvements and much additional information. The chronological table of principal events in railway history has been almost entirely recast, and includes approximately double as many dates of historical importance as any previous edition. Several of the new features now included in the *Railway Year Book* will be of considerable value for reference purposes. Of these may be specially mentioned particulars of power signalling equipments on railways in the United Kingdom; tables setting forth the systems of train illumination employed on various railways and the relative numbers of vehicles equipped with gas, electric or oil lighting; information in reference to the use of feed-water heating apparatus on locomotives; the constitution of the Royal Commission on Railways; dates of commencement of public railway traffic in various countries; the use of coinfreed machines for issuing platform and small-fare tickets, and other useful facts and figures. The new system of preparing the returns and accounts of railway companies, has enabled a great deal of additional information to be given; and while the historical sketches have been revised, and considerably amplified, the appended statistics are given in an entirely different form, including more precise particulars than have hitherto been possible. Certain other portions of the book have also been influenced in the same way, and in several instances data is now given on a more comprehensive basis, as in the case of the table of numbers of passengers conveyed on railways carrying more than 10,000,000 per annum. Several of the maps have been re-drawn, additional biographies included in the "Who's Who" section, and all standard features have been revised and brought up to date; these and other changes and improvements in the aggregate strongly support the claim of this volume to be described as the "Whitaker of the Railway Service."

* * *

MODERN RAILWAY WORKING. [The Gresham Publishing Company.] Volume VII. is now available and well maintains the characteristics of its predecessors. Section III. railway mechanical and electrical engineering is continued, with chapters on signalling and train control, by Mr. Herbert E. Morgan, and section IV. is commenced, Mr. Henry W. Ede, dealing with the working of the goods department, Mr. H. L. Lister with the principles of railway goods rates, and Messrs. Felix J. C. Pole (Great Western Railway), and James Holme, B.Sc., with the economics of passenger traffic. The plates deal mainly with railway advertising, four including reproductions in colour of a selection of railway posters. In every way this volume is quite up to the standard of those already published.

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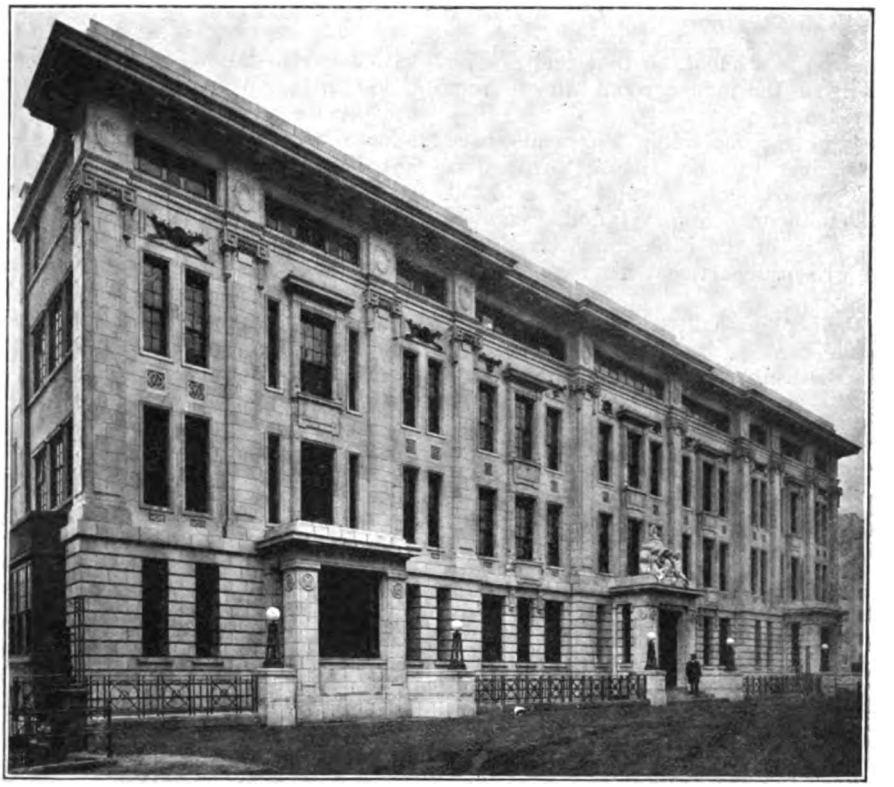

Photo] [*E. Mûner.*

THE MAIN FRONTAGE TO ALLSOP PLACE.

The New Headquarters of the Metropolitan Railway.

IT is not every day that a leading railway company erects entirely new chief office premises; and for that reason the new buildings at Baker Street station, which now accommodate the headquarters of the Metropolitan Railway Company, call for special attention. The general features of the work were set forth in our last number, so that there is no need to recapitulate information then given; but we have since been afforded an opportunity of going over the building, so that further reference is justified. The photographs reproduced have been specially taken.

The building presents its main frontage to Allsop Place, and as will be gathered from the photographic view on this page and the line drawing reproduced last month, an imposing elevation has been realised. On this side there are four floors, but on the station side there are seven, the lower ground floor, entered from the booking hall of the station and below road level, with two floors below this alongside the station tracks being added.

For convenience we may traverse the building from the lowest level upwards. In the basement only a small space is occupied, owing to the location of the station platforms and tracks. Here is the boiler room for the heating plant, with two "Ideal" boilers for the heating system, and a small heater for supplying hot water to the lavatories throughout the building, and for use in the kitchens, the latter being run all the year round, whereas the ordinary heating boilers will only be used when required. An accelerating pump is used for forcing circulation. The radiators have been supplied by the National Radiator Co., Ltd. Alongside No. 4 platform line in

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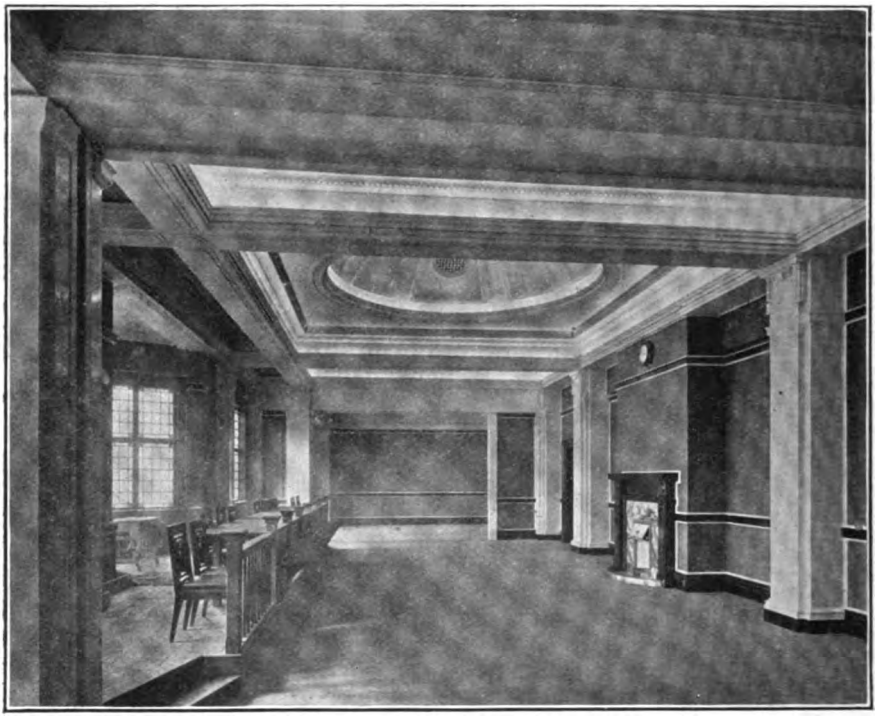
the station is a shoot, so that fuel can be supplied to the boiler room direct from railway trucks.

Much of the remaining basement space is given over to store rooms, devoted to various departments, several being fitted with Dreadnought fireproof doors in view of the value of the books and records enclosed. Each department has its own store room.

On the booking hall or lower ground floor, is a wide corridor from the station booking hall, artistically designed, leading to a hall from which open the offices of the Commercial Manager, Mr. John Wardle; with the Traffic Superintendent's (Mr. W. Holt) offices, further along. Here also is the Estate and Rating officer, Mr. F. Dawson. The corridors here and throughout the building are floored with "Decolite," a composition supplied by Bells United Asbestos Co., Ltd., while in the halls mosaic is used, laid down by Rust's Vitreous Mosaic Co.

A portion of this floor is devoted to the female employés, a staff of about 30 girls, with accommodation for 20 more, engaged in ticket sorting. Adjacent is a room containing the private telephone exchange, where two operators are engaged. There is a separate entrance for the ladies, and they have their own accommodation and refreshment rooms. The telephone system was installed by the railway company, material being largely supplied by the Western Electric Co., Ltd. There is complete inter-office telephone equipment, connected with the Post-office telephone system. In the telephone room are two Magneta clocks controlling electric clocks throughout the building, one being used as spare, the connections being switched over from one to the other as required.



Photo] [*E. Milner.*

THE BOARD-ROOM BEFORE FINAL EQUIPMENT.

The traffic department offices are grouped together, the general principle adopted being that of a subsidiary vestibule with the public and private offices pertaining to that department opening therefrom. Adjacent are the estate and rating departments, and the time-table office.

On the ground floor are the General Manager's and Engineer's suites of offices, with the board room, Chairman's room

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other special sections towards the main frontage on Allsop Place. The engineer's department consists of a suite of offices, with drawing and general offices for the engineering and architectural divisions, the former under Mr. Pearson and the latter under Mr. Clark, with Mr. Willox as chief of the whole division. The registration and transfer offices are also on this floor. The General Manager's offices are similarly grouped, with despatch and general offices adjacent to the private rooms. Mr. Selbie's private room is distinguished by the quietness of its artistic decorations and excellent equipment.

Photo] [*E. Milner.*

THE OFFICERS' DINING ROOM.

The ground floor in the main frontage is given over on one side to the chairman's private room, and to the officer's dining room, this being a splendid apartment where the chief officers and any directors who may be present usually lunch together. An alcove is formed by what is in appearance exteriorly a third doorway, there being in fact, only two entrances on this side, one for general use, the other on special occasions. Connected with the officers' dining room, is a servery with accommodation for an attendant, with an automatic dinner lift installed by Messrs. Waygood, communicating with the kitchen at the top of the building. Hot closet and other conveniences are included according to requirements.

On the other side of the corridor is the board room, the *pièce de résistance* of the new premises. This is a splendid apartment, the ends being divided off by disappearing partitions, to form two committee rooms, the whole of the space available only being required for general meetings and special functions. Double windows are provided to ensure quietness, and these are of artistic design, with tinted glass ornamentation. In the centre of the roof is a shallow dome, and this, as well as the panels formed by the ceiling design, is outlined with concealed electric lights for reflected illumination. An exceedingly effective lighting scheme is thus realised, and in conjunction with the neutral colour of the walls panelled by white oak and finished mahogany cabinet work, an exceptionally pleasing result is obtained. The walls are decorated with portraits of

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chairmen and directors, past and present, with a few old prints. The mahogany cabinet work in this room was supplied by Messrs. Martyn's, of Cheltenham, and the oak work in General Manager's office by Messrs. Elliott's of Newbury. The fireplaces, where used, were installed by Messrs. George Wright, Ltd.

We may here mention that Messrs. Hill & Harrington were responsible for the electric lighting installation throughout, using Messrs. Siemens "Wotan" lamps with "Holophane" shades where required, Audit office, there being here one of the largest single offices in the building; with a few smaller offices. The third floor includes accommodation for the housekeeper kitchens and a dining room for the staff. At one end the building is still higher to accommodate the tank house for the water supplies.

The building as a whole is of ferro-concrete, on the coignet system, the contractors being Messrs. Henry Lovatt Ltd. The faience frontage in Allsop Place was however made and erected by Messrs.

Photo] [*E. Milner.*

THE TICKET-SORTING DEPARTMENT.

supplied by the Sun Electrical Co., Ltd. The boardroom furniture is by Messrs. H. C. Cleaver Ltd., and the general office furniture by G. M. Hammer & Co., Ltd., Messrs. Beaven & Sons, installed the general heating system.

Adjacent to one of the main doorways is a Waygood automatic lift for passengers, connecting with all floors.

Ascending to the first storey we find the Solicitors', Accountants, and Surplus Lands departments, each consisting of a group of connected offices. A floor above is the Gibbs & Canning, of Tamworth. Gay's paints were used and Hall's distemper. Messrs. W. T. Allen, of Queen Victoria Street, supplied the staircase railings, and Messrs. R. & A. Main Ltd. the cooking ranges and apparatus.

We are indebted to Mr. John Wardle, Commercial Manager, for facilities for inspection, and special acknowledgement may be made of the valued assistance as guide of Mr. F. S. Jones, one of Mr. Wardle's principal assistants, and of various officers of the company who co-operated in other ways.

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Result of the "Letter Competition."

THE competition organised to celebrate the publication of the 200th monthly issue of the RAILWAY MAGAZINE has produced a most gratifying response from readers in all parts of the United Kingdom, besides a few resident in other countries; and the selection of letters worthy of the prizes offered has been no easy task. Congratulatory remarks are offered in virtually every instance, and we highly appreciate the compliments paid to ourselves and to the writers of the articles contained in the February number. But the purpose of the competition would not have been served had letters dealt only with this phase; and in many instances suggestions for desirable features and developments possess considerable value, and will be adopted as far as practicable in due course. In several cases impracticable ideas were advanced, and there was a strong tendency to overlook commercial aspects, and the fact that only a limited number of pages are available each month. On the whole, however, the numerous letters received are well worthy of careful study, and the effects of this competition will be evidenced in the future history of the RAILWAY MAGAZINE.

After due consideration of all efforts submitted we have pleasure in awarding the prizes as follows:—

The FIRST PRIZE of Two Guineas to
LAURENCE HEWITT, 60, Lower Oldfield Park, Bath.

Two Prizes of ONE GUINEA each to
THEODORE HORN, Exeter College, Oxford; and
W. P. THOMPSON, 49, Kenilworth Park, Harold's Cross, Dublin.

Four Prizes of TEN SHILLINGS each to
G. F. BRYAN, 65, Langworthy Road, Moston, Manchester.
S. W. A. NEWTON, "Finmere," 336, Victoria Park Road, Leicester.
C. H. TURNER, 70, South Street, Rugby; and
K. A. WHELLOCK, 14, Cromwell Avenue, Ravenscourt Park, London, W.

Eight Prizes of FIVE SHILLINGS each to
A. ALLAN, 101, Smith Street, Govanhill, Glasgow.
E. V. BOND, Accounts Office, Bricklayers' Arms Station, South Eastern and Chatham Railway, London, S.E.
A. K. CASSE, Fleet Road, Fleet, Hants.
J. DALBY, 49, Whitaker Road, Derby.
E. J. Harding, 43, Wing Road, Linslade, Leighton Buzzard.
T. KAYE, 75, Fenton Road, Lockwood, Huddersfield.
W. F. LAWRENCE, 6, Dodgson Terrace, Acomb, York; and
C. MARRIOTT, 10, Hoad Terrace, Ulverston, Lancashire.

Fifteen Prizes, each consisting of a bound Volume of the RAILWAY MAGAZINE, to
W. T. ADDISON, 94, Leppings Lane, Wadsley Bridge, Sheffield.
H. M. ALDERMAN, The Lodge, Claremont, Esher, Surrey.
A. BAKER, 16, Elm Grove, Brighton.
G. BALMER, 31, Wellington Road, Newark-on-Trent.
G. H. BURGESS, 20, Broad Street, Stratford-on-Avon.
J. GARDENER, Morfa House, Wychtree Street, Morriston, Glam.
T. GOSWELL, 52, Rylance Street, Openshaw, Manchester.
N. W. HOLMES, 10, The Grove, Shaw Heath, Stockport.
M. A. HOPE, 33, Manley Street, Lower Ince, Wigan, Lancs.
C. E. MARTEN, 38, Orchard Hill, Lewisham Road, London, S.E.
D. MURRAY, 27, Storie Street, Paisley.
F. SHUTTLEWORTH, 6, Lawson Street, Barrow-in-Furness.
D. SIM, District Traffic Supt.'s Office, Caledonian Railway, Perth.
J. E. L. SKELTON, Robinites, Charterhouse, Godalming.
N. WILSON, Staff Inspector, Waterloo Station, London and South Western Railway, London, S.E.

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What Manufacturers are Doing for Railways.

Time Registers.

TEN to fifteen years ago, when automatic time registration was just about getting a footing, it was necessary to strenuously advocate its use, but in these days an automatic system of checking the time of employés is recognised as a necessity where men are paid by time or by weekly wages; in fact, whatever the method of payment may be, for even where the piecework system is in vogue employers cannot depend upon it entirely to produce to the fullest capacity, an automatic check on the time kept by the workers increases output, reduces the wages bill, prevents dilatory employés wasting the time of punctual arrivals, and shows which are the good, the bad, or the indifferent workers. No matter how the employés are paid, a proper automatic account of the time they work profits the employer to an extent, besides which, the cost of the installation sinks into insignificance.

The first attempt to produce an *automatic* check was an elaboration of the brass check and key board system, checks being dropped into a circular tray divided to represent different periods of ¼ to ½ an hour, with the same necessity for sorting out the checks and entering up of time, with the additional work of distributing the checks, and without any greater security against collusion, errors, or disputes. In due course time registering machines of the types now extensively adopted were developed; and they are largely employed in all large works. Among such machines those supplied by the firm known as "Dey Time Registers Limited" are in considerable favour, and many of them are installed in the Derby Locomotive Works of the Midland Railway.

The machines used by the Midland Railway Company are mostly of the No. 101 design, recording each for 100 hands, fitted with a card attachment for recording special time of messengers and outside workers and with a two-colour ribbon to record the time of late arrivals, employés leaving early or working overtime in *red*, thus facilitating clerical labour in making up the pay roll, the records in *green* being taken as full time. Altogether, this firm have supplied to the Midland Railway Locomotive Works 27 machines and to the Goods Yard at Leeds, 1 machine. This system is also used by the Midland Railway hotels. The first order at Derby was received in 1905. From that time they have steadily added Dey Time Registers to their plant.

Mechanical Stokers for Steam Boiler Furnaces.

A LARGE proportion of the boilers used in electric lighting, power and other steam plants are now fitted with mechanical stokers, the "Underfeed" design introduced by the Underfeed Stoker Company, Ltd., being very extensively employed. This apparatus is used in the electric power station at Derby Works, Midland Railway, fitted to the Stirling boilers there installed. In the Underfeed Stoker the fresh fuel for the maintenance of combustion is continuously supplied from below the level of the fire and gradually advanced upwards towards the zone of combustion by simple mechanism. These stokers are built in three classes, designated as the "B," "D" and "E" types respectively. Class "B" stokers are especially designed for boilers of the internally fired type. They are generally actuated by a simple gear drive, receiving power from a line shaft in front of the range of boilers, though in special cases a self-contained direct steam motor drive is used. Class "D" stokers are of larger capacity and are generally employed for water-tube boilers up to a width of firing grate of 5 ft.; also for small metallurgical furnaces and for ships' boilers. Class "E" stokers are for the larger sizes of water-tube boilers and other externally fired boilers, also for large metallurgical furnaces. A single stoker of this class will steam a boiler having a firing grate as wide as 12 feet.

In the "B" type of stoker a taper feeding worm in the fuel chamber below the grate feeds the coal, which is gradually pushed up to the burning point, thence passing on to the grate, which is usually of terraced type. Air is supplied through tuyeres. At the burning point the coal is coked or deprived of its volatile hydrocarbon gases. These being mixed with air introduced at this point through the air inlets of the fuel magazine, escape being possible only by rising through the glowing coke above, they are heated to such a high temperature that they are completely consumed without smoke, while the combustion of the fixed carbon of the coal is completed by the air introduced through the apertures in the sides of the terraced grates. The effect of this method of underfeeding is to keep a perpetually clear, bright surface of incandescent fuel, which always produces its maximum steaming effect upon the boiler without the inevitable fluctuations of furnace temperature consequent upon hand-firing. Smoke is thus practically impossible

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with the most highly bituminous coals, and as the combustion of the gases is all but complete by the time they have passed through the ever-present superincumbent layer of glowing coke, a clear, short flaming fire results, so that the final and perfect burning of the gases is not prejudiced by their inevitable contact with the comparatively cold heat-absorbing tubes or plates of the boiler. The capacity of a boiler is thus increased and its life prolonged, and inferior slack coals are burned at high ratings and with high efficiency. It is claimed that as a simple business proposition the stoker will usually earn its entire first cost in less than two years after installation—equal to a fifty per cent. investment, and many cases are on record where the entire cost of the equipment has been saved in less than one year.

Watertube Boilers in Railway Service.

In view of the comprehensive operations involved by the activities of a large railway company, it follows that almost every class of engineering equipment is used in one way or another, and many interesting and extensive installations of watertube boilers could be referred to, for supplying electric power and light, for running shop machinery, and other purposes. Thus, in the power station associated with the Derby Works of the Midland Railway, three Stirling boilers are used for supplying steam for the turbines and engines, their capacity being also utilised in the smithy adjacent. They are of the usual five drum type, three steam drums and two mud drums.

The three upper steam drums are supported by brackets carried on steel beams, which in turn rest on steel columns. These columns are built entirely independent of the brick-work, so that this may be removed or replaced without disturbing the boiler or its connections. The brick setting only serves the purpose of a housing to confine the heat and to provide furnace space. The entire front of the boiler is constructed of steel of substantial and pleasing design. The mud drums are suspended by the tubes expanded into them, and, not being in contact with the brick-work, are left free to accommodate themselves to any movement from expansion and contraction. Four banks of vertical tubes connect the drums, while water tubes are provided between the first and second steam drums and between the two mud drums. All the three steam drums are connected together by means of steam connecting tubes expanded into the shells in the same manner as the main tubes. Suitably disposed fire-brick baffle tiles arranged between the banks of tubes direct the gases into their proper course.

The safety valves and stop valves are generally connected to either the middle or rear steam drum. The feed connections are placed at the end of the rear steam drum. Access to the interior of the boiler is obtained through manholes provided at one end of each drum. These parts constitute the complete boiler, which represents the acme of simplicity and eliminates the complication of the older types. A firebrick arch is sprung over the grates immediately in front of the first bank of tubes. The large triangular space above the arch between the boiler front and the tubes is available for combustion chamber. The arch absorbs heat from the fire, becoming an incandescent radiating surface, which heats the air required for combustion, ignites by radiation the gases distilled from the coal, and prevents the boiler from being chilled by an inrush of cold air when the furnace doors are opened.

Feed-water enters the rear top drum through the check valve and passes into a feed distribution box, which is placed the whole length of the drum. By means of this box the feed is distributed over the whole width of the boiler and ensures that every tube receives a proportion of the entering feed water. Water passes down the rear bank, up the third bank, down the second bank, and up the front bank. Here the steam formed during the passage up the tubes disengages and passes through the upper or steam-circulating tubes into the middle drum, while the solid water passes through the lower or water-circulating tubes into the middle drum. This water again joins the main circulation and passes down the second bank and up the front bank, continuing its former course until it is finally evaporated. At Derby these boilers are each fitted with a Foster superheater, and the steam, generated at 170 lbs. per sq. inch, is superheated 150°.

The Electrical Equipment of Railway Workshops.

A considerable number of motors have been supplied by the firm of Electromotors, Ltd., for use in railway workshops, either for running groups of machines or all the tools in a particular shop, or for operating direct-driven machine tools of larger sizes. They are to be found in the Derby works of the Midland Railway, and other large locomotive and railway shops. This firm is largely concerned in the electrical equipment of the Eastleigh works of the London and South Western Railway, now in progress. The scheme was prepared by Mr. Herbert Jones, electrical engineer, London and South Western Railway, and consists of a generating plant of Diesel engines direct-coupled to Witton dynamos, with a battery of accumulators and motor-driven boosters supplied by Electromotors, Ltd., of Openshaw. This firm have also been entrusted with the contract for the equipment for the carriage and wagon shops, requiring about 1,000 b.h.p. in motors, with all switches, gear and accessories. The motors are of the enclosed ventilated type, with copper gauze grids to exclude chippings. The saw mill is at present driven by an 180 h.p. steam engine through main rope drives, while the machine and smiths' shops are driven by another engine of 160 h.p. In addition, a number of Roots blowers, shears and punches have self-contained steam engines, these being fed by seven locomotive boilers. In the electrical scheme the whole of the boiler and

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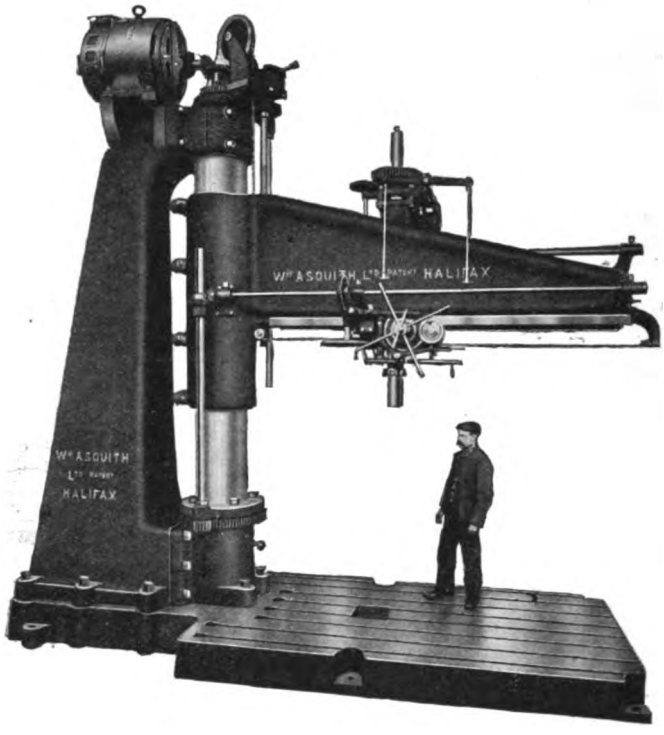

A LARGE RADIAL DRILL DIRECTLY OPERATED BY AN ELECTRIC MOTOR SUPPLIED BY ELECTROMOTORS, LTD.

engine plant is dispensed with except that for the steam hammer, and the new system provides a combination of individual and group driving. The motors installed vary from 5 to 60 h.p., and all the large tools and those of later date have their own motors. Outlying machines, such as the Roots blowers, shears, and punches, are each to have their individual motor. The equipment when complete will represent one of the most up-to-date electrical equipments in the country, and will comprise various forms of driving, including direct coupling, Morse chains, double helical gears, belt and straight tooth paper pinions.

Feed-water Heaters for Locomotives.

THE increasing demands made upon the locomotive engine of to-day, and the special attention devoted to the utilisation of the steam to its fullest extent, has caused a renewed interest to be taken in the subject of locomotive economies. It is, however, difficult to appreciate that the conservation of at least a portion of the heat at present lost in the exhaust steam should have been so long neglected, especially as it offers a direct and calculable economy, simplicity of application, low maintenance and running cost, and no demand for additional skill or attention on the part of the driver.

Any heat obtained from the exhaust steam and returned to the boiler means a direct economy in fuel, which may be taken approximately at 1 per cent. of fuel for every 11° rise in temperature of the feed water. Further, the successful application of feed heating to marine and stationary engines has long been before locomotive engineers as a means of improving the economy of the locomotive, and at intervals attempts have been made to apply feed heating systems to locomotive conditions, but, up to the present, with little or only very partial success.

In view of their long experience in feed heating problems and pump design, Messrs. G. & J. Weir, Ltd., have devoted attention to the application of their specialised knowledge in these departments to the production of a system of locomotive feed heating which will overcome the difficulties hitherto encountered and meet the conditions of locomotive service. The amount of saving effected by the Weir feed heating system naturally varies with conditions, but results of actual applications indicate a direct saving of from 8 to over 12 per cent., while an additional effect is obtained, but not calculable, in the better steaming performance of the boiler.

Considerable success has attended the use of Weir pumps in railway service, with and without the Weir heater. A considerable number of Weir pumps are to be found on the London, Brighton and South Coast Railway, and among home railways using the complete Weir system may be mentioned the Glasgow and South Western, London and North Western, Great Northern, Lancashire and Yorkshire, Midland and North Eastern Railways. In the case of locomotives built in Great Britain for service abroad, the Weir pump and heater are used in a considerable number of cases. The Bombay, Baroda and Central India Company now have 113 Weir pumps in use, and 157 pumps for the Great India Peninsula Railway are at work or in hand. Among the other foreign railways using Weir auxiliaries are the Egyptian State, Union of South Africa, Buenos Ayres & Pacific, Indian State, Buenos Ayres Western, San Paulo, Antofagasta & Bolivia, Canadian Pacific, Grand Trunk, Russian State, and Royal Prussian State Railways.

Electric Train Indicators.

AN interesting development of the platform and destination indicators provided at stations of a terminal character is seen at Baker Street, Metropolitan Railway. Here the McKenzie,

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Holland and Westinghouse Power Signal Co., Ltd., have installed three indicators, one in the main booking hall, one in the circulating area adjacent to the "outer rail" Circle line, and the other in the "Bakerloo" hall at the other end of the station. These are all operated together from the signal cabin and include four vertical lists of stations. That to the left refers to the first train out on the extension side, giving the platform concerned, the names of those stations at which the train calls being illuminated, any passed without stopping being left dark, as also is the case with stations beyond the terminating point of the train in question. The next column similarly shows the platform and calling stations of the second train; and as the first leaves, the indications from the second column are at once shunted over to the first column, and a new record is shown applying to the following train. These two columns apply to stations between Baker Street and Uxbridge, thus covering all requirements except for trains going further afield. The third and fourth columns are used for longer journey trains to Chesham, Aylesbury and Verney Junction, or as far as a train may go on those routes. In view of the fact that these trains also serve one or more stations shown on the first and second records, the required indications as for first and second trains out are also given there as far as they apply, though for main line stations it is necessary to refer to the right hand columns. Such an indicator is eminently suitable for the conditions which apply in this instance, but can be developed considerably to meet more complicated requirements; and affords an interesting instance of the application of electric methods of control and indication for railway station purposes.

Railway Office Work.

It is more than ten years since the Stolzenberg system made itself felt amongst other filing systems in this country. Railway companies were not slow in discovering its merits. To-day practically every railway company has some form of Stolzenberg specialities in its offices. The foundation or basis of the system is the well-known flat file with nickel steel binder. By the use of the binder security of papers is ensured. At first the binder was supplied in a crude form, later improved upon and made in black steel, and finally, at no extra charge, it is to-day obtainable in nickel steel, being neat in appearance and without sharp edges. Secretaries, engineers, superintendents of the line, passenger agents and accountants, in fact all officials of railway companies, have adopted the filing system in one way or another with unqualified success. The makers point out that a file from 4 inches square (used for small notes) up to a size large enough to take a daily newspaper can be had for a few pence, so it will be seen that the system is inexpensive. It is not only in connection with files for papers that the Stolzenberg Patent File Co. Ltd., have built up a reputation, but they are in the front rank for office furniture, and their desks and tables may be seen in the board-rooms and offices of some of our leading railway companies. The outstanding feature of their furniture is the extensible writing surface, absence of ugly pigeon-holes, effective utilisation of space, even the sides of the desk being usefully employed, and the general adoption of panel methods of construction. Any railway official interested in the card index would do well to call at the showrooms of the Company, at 210-212, Bishopsgate, and see specimen rulings of cards. A profitable half-hour can be spent in examining cards and office equip mentfor railway offices. This firm has branches at Newcastle, Glasgow and Manchester, and their lists and catalogues are full of useful information for reference in any office.

Typewriters in Railway Service.

Everything which has for its object the promotion of greater efficiency and economy must necessarily form part of the policy of every great railway company. In recent years this has been by no means confined to improvements in running departments, the building of powerful locomotives and palatial stations; for, though not quite so evident to those outside, great progress has also been made in the all-important matter of internal office equipment and organisation. As a striking example of this we are able to announce that the Caledonian Railway have just placed an order with the Underwood Typewriter Company for no fewer than 120 of their latest model machines for immediate delivery. These machines will be distributed all over the system to replace a similar number of machines of various makes. It will be remembered that some three years ago, after making exhaustive tests of all the leading makes of typewriters, the Caledonian Railway placed a contract with the Underwood for the exclusive supply of machines for a period of five years. The large order now placed will have the effect of practically standardising Underwoods throughout the system, and is a convincing proof of the satisfaction which this well-known make has given.

Turret Lathes.

There are few great railway workshops where at least one or two "Hartness" turret lathes, supplied by the Jones & Lamson Machine Co., of 97, Queen Victoria Street, London, E.C., are not to be found. These useful machines may be described as semi-automatic, in that after being set, repetition work can be done by unskilled labour, while the range of adjustability gives scope for very wide diversity of duties. Bar work, including turning, screwing, and other operations is the special field, but a large number of details can be machined in similar ways.

In the Hartness flat turret lathe for bar work, the automatic chuck is specially constructed for handling rough bars. The jaws are of unbreakable form and may be readily made for any size

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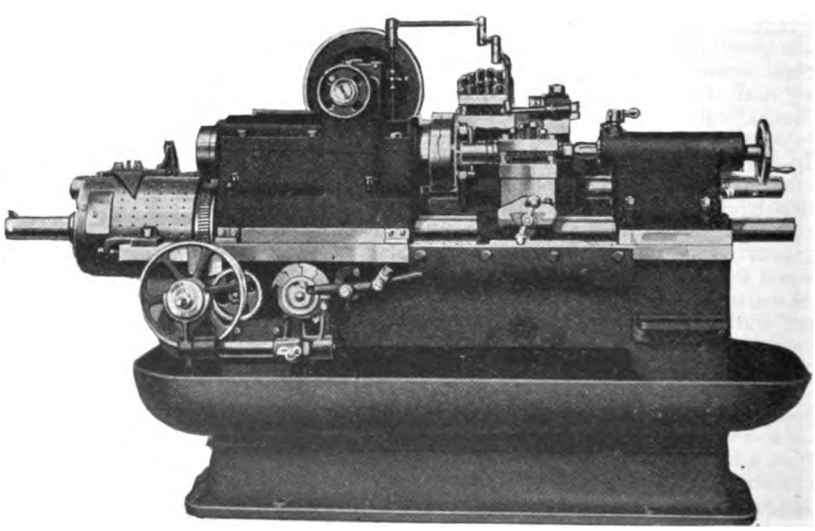
or shape within the spindle's capacity. The roller feed is operated by the same movement that opens and closes the chuck. The present design of chuck and roller feed has been in continuous use for 20 years, the only changes being those resulting from long use and natural evolution. The cross-sliding head has a cross travel. This is indispensable on chuck work and is frequently convenient on bar work. It gives a cross feed for every tool without resorting to the frail double slide under the turret. Each position of turret is equipped with two separate stops, making 12 in all. If desired, seven stops can be used for one tool. The cross travel of the head is controlled by nine stops. Both sets of stops act in both directions, and are placed as near as possible to the direct line of stress. The regular outfit includes the No. 6 Hartness automatic die with nine sets of chasers for Whitworth standard threads from 1 to 2 in. in diameter by eights. Special chasers can be supplied for left hand threads, also acme and pipe threads. A friction countershaft is regularly supplied.

A number of other variations are also available, for chucking work, and for other specific requirements. The same firm also supply the Fay automatic lathe. This machine is designed for manufacturing in quantities; it is particularly adapted to handling lathe work which is held on centres or carried on arbors. The 14-inch design swings 14 in. over the shears and 10 in. over the carriage. It will turn up to 10 in. in length. The movements are entirely automatic, the machine stopping itself when the work is completed. The machine drives from a two-speed countershaft on to a 7½, 11¼ or 15-inch cone for a 4-inch belt, given six speeds; these range from 26 to 152 revolutions per minute. Speeds may be varied for special work. The spindle is hollow and of large diameter, driven by worm and gear, giving a powerful and noiseless drive. The movements of the various tools are controlled by adjustable cams. The camshaft has an adjustable quick drive for idle motions, and a slow drive through change gears for feeding. The carriage, attached to the central shaft, has lateral motion obtained from cams on the cylinder. Movement in the vertical plane is given by removable formers, operated through slide bar from cylinder. The back tool arms are independently adjustable on the rear shaft and have a lateral motion given by the cylinder. Movement in the vertical plane is obtained from a separate heart cam. Taper turning is effected by the use of formers on the slide bar, operating the carriage; for steep tapers, such as the faces of bevel gears, etc., a special taper attachment is provided, controlling the back tool arm. Form turning in wide variety is also effected by formers operating the carriage.

Electric Industrial Trucks.

REFERENCE has already been made on several occasions to the use of electric trucks for industrial transportation about railway works and warehouses; and a vehicle of this kind is used at the Midland Railway Locomotive Works at Derby. We are informed that "The Railway Track Supply Co. (of Great Britain)," 79½, Gracechurch Street, London, E.C., have recently received an order from the Midland Railway Company for a "Buckwalter" electric industrial truck, for use at their Derby works. A number of these useful vehicles are now used by various railways in Great Britain. A drop frame truck has just been delivered to the Great Central Railway, while the Great Western Railway have four



14-INCH FAY AUTOMATIC LATHE.
Supplied by the Jones & Lamson Machine Co.

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A 2-TON "BUCKWALTER" ELECTRIC TRUCK LOADED WITH SACKS OF FLOUR.

warehouse trucks of this class. An illustration is given showing an "Edison-Buckwalter" freight truck loaded with sacks of flour, loads up to 2 tons being conveyed. The latest type of Edison "Nickel" battery is employed. The vehicle can be turned within a radius of 7 ft.

Oil Engines in Railway Service.

BUILT by the Westinghouse Brake Co., Ltd., the Cross Oil Engine, is of the vertical, single-acting, four-cycle type, and the whole of the moving parts are enclosed. It is constructed to use crude oils or residuals as fuel, but will work equally as well on ordinary lamp oils. The engine is of the high-speed, high-compression type, and makes use of the heat of compression to ignite the fuel charge sprayed into the combustion chamber of the cylinder.

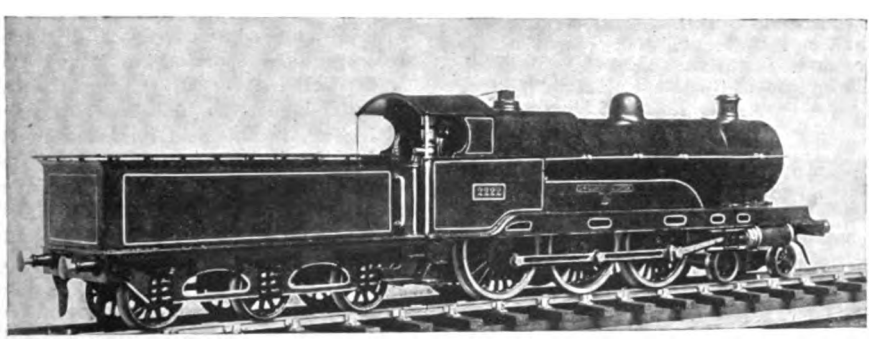
These engines form a very convenient and efficient method of driving electric generators, either for power or lighting purposes. Owing to the small amount of fuel consumed, and its cheapness, electric current can be generated at a very small cost, with the great advantage of having an independent supply of power. They are also used for portable plants, for pumping, for running the machinery in small shops, and for many other purposes, railway and general.

Locks and Oil Cans.

FAMED for railway carriage door locks, Messrs. Joseph Kaye & Sons, Ltd., Leeds, have another side to their business—one which is not entirely railway equipment—we refer to Kaye's patent seamless serrated oil cans fitted with patent seamless spouts. The firm have just received orders from the British Navy for 4,468 of these cans, making a total of 60,048 of this particular pattern alone. The cans will be distributed during April to the different dockyards. During March, among the orders received by this well-known firm were one from the Great Central Railway for 348 patent carriage door locks and one from the Great Western Railway for 360 oil cans.

Models as an Aid to Railway Advertising.

SLOWLY but surely those responsible for the advertisement departments of our leading railway companies are awakening to the many advantages offered by railway models, either for display, or for educative purposes. Nearly all the leading lines have signalling instruction plants, including model signals, levers, ground gear, and so forth, operated exactly under service conditions although, of course, in miniature. For purely advertising purposes nothing can equal a first-class scale model indicating the attractive features of the line, such models as those used by the London and North Western, Great Northern, Canadian Pacific, and other railways, built by the well-known model railway engineers, Messrs. Bassett-Lowke, Ltd., of 112, High Holborn, London, and the "Lowko" Works, Northampton. Many fine models are operated under coinfreed control, the proceeds usually being devoted to a benevolent agency associated with railways, and a number of these have been made by the same firm. Messrs. Bassett-Lowke have probably done more to popularise interest in railways in this way than any other firm in the world, and their models are well known the world over. They are true to scale, and represent in miniature all the characteristics of the real engine. Many of their



A REMARKABLE LOCOMOTIVE MODEL, *Sir Gilbert Claughton* CLASS, LONDON AND NORTH WESTERN RAILWAY.

Built by Messrs. Bassett-Lowke, Ltd.

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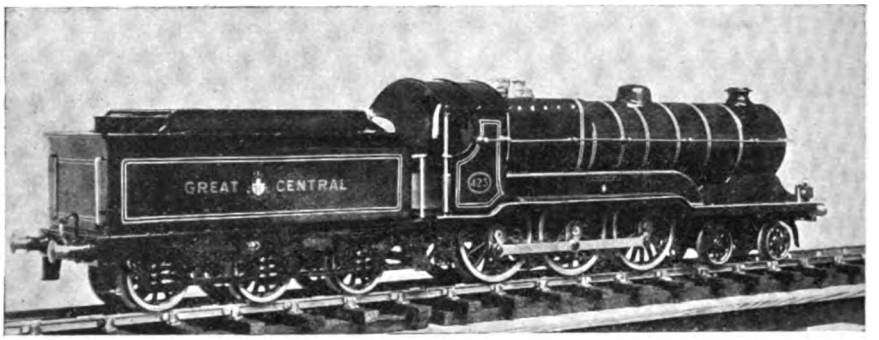

MODEL OF *Sir Sam Fay* LOCOMOTIVE, GREAT CENTRAL RAILWAY.
Built by Messrs. Bassett-Lowke, Ltd.

customers operate comprehensive model railway systems, running their trains to time table, and carrying out relatively complicated traffic operations. The most recent work of Messrs. Bassett-Lowke is the production of the two fine model engines illustrated.

The London and North Western Railway latest express locomotive, *Sir Gilbert Claughton*, is arranged as a working model, and is steam-driven. The photograph reproduced will give a good idea of its accuracy. The Great Central 4-6-0 locomotive No. 423, *Sir Sam Fay*, serves as a prototype for the clockwork model shown. These are both excellent examples of the model makers' art, and should carry on the good work of impressing upon the public that after all, British railways, large or small, still remain the finest in the world.

A New Steamer for Dover-Ostend Service.

THE Belgian State maritime mail service has just been reinforced by the addition of a new steamer, the *Ville de Liege*, which brings the number of turbine boats engaged in the passenger traffic between Ostend and Dover to five. Put into service on the 14th of January, 1914, the new vessel comes from the ship-yards of the Societe Cockerill; she was subjected on December 24th, 1913, to endurance trials, which consisted in six consecutive runs carried out under full steam, between the *West Hinder* and *Ruytingen* light-ships. Specially built for the winter service; her superstructures have been amply strengthened so as to enable her to maintain in any sea a speed of 22 to 22½ knots and to ensure passages of an average duration of 3 hours, which must be considered highly satisfactory.

The principal dimensions of the *Ville de Liege* are as follows:—

Overall length ..	313 ft. or 95·400	metres.
Length at the water-line.	300 ft. or 91·437	,,
Moulded breadth ..	36 ft. or 10·982	,,
Depth (up to upper deck)	22′ 9″ or 6·395	,,
Draft	9′ 10″ or 3·00	,,

Life-saving appliances, such as life-boats, rafts, deck-seats with air-caissons, life-belts and buoys, constitute a complete equipment, fully meeting the most recent requirements of the British Board of Trade. Moreover, the hull is subdivided into ten compartments, separated by water-tight bulkheads extending to above the water-line, or provided with hydraulically actuated doors on the Stone-Lloyd system, operated from the wheel-house and controlled by an indicator-board. The essential innovation introduced consists in the fitting up, in the hold immediately afore the stoke-hole, of water tanks of a special form designed by Mr. Frahm and which are intended to lessen the rolling motion. Weight of the water required for working the anti-rolling devices, represents about 2% of the displacement. The *Ville de Liege* is a sister-ship to the *Stad Antwerpen*, the turbine steamer which was put into service recently, and which has likewise given proofs of excellent sea-going qualities in several crossings made in very bad weather.

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The Federation of British Health and Holiday Resorts.

REFERENCE has already been made to the steps which are being taken in various quarters with a view to extending the period of intense holiday traffic, in the interests of holiday makers themselves as much as with a view of reducing the pressure upon railway and lodging accommodation during the few weeks which are utilised at present by the majority of people going to the seaside and country resorts. An associated measure is that of directing the attention to people on the Continent to the holiday attractions presented by this country. In connection therewith the Federation of British Health and Holiday Resorts have invited a number of French and Belgian newspaper editors for a tour of inspection.

On the arrival of the party at Boulogne on June 11th they will be received by representatives of the Federation, and their itinerary in this country will be as follows: Folkestone, Margate, London and Windsor, Scarborough and Lowestoft, Blackpool, Southport, Isle of Man, North Wales, Malvern, Droitwich, and Leamington, Weston-super-Mare, South Devon, along the South Coast, the tour extending from June 12th to the 30th. A banquet at the Savoy, will take place during the stay in the metropolis, and the guests will be entertained by his Majesty's Government.

On March 12th a conference was held at the Guildhall, Mr. John Hinds, M.P., presiding; and was preceded by a luncheon at De Keyser's Hotel, attended by delegates from all parts of the country as the guests of Lord Burnham and the Hon. Harry Lawson, M.P. There were present representatives from many of the leading railway companies, in addition to members of interested communities. Proposing the toast of "Success to the Federation of British Health and Holiday Resorts," Mr. Lawson (Chairman) stated that 60 towns have been affiliated, representing a rateable value of more than £9,000,000; and that the Duke of Argyll has consented to become the Patron and President of the Federation. The Chairman pithily described the scheme as a "national insurance of national health and national happiness."

Colonel Burn, M.P., in proposing the toast of "The Railway Companies," said he was entirely in agreement with the scheme for which the Federation stood, because he felt it was necessary above all things that they should make the health resorts and the beauty spots of the United Kingdom known not only in our own country but throughout the length and breadth of the Continent. What they needed in order to secure the success of such a scheme was co-operation, and very necessary co-operation was that of the railway companies.

Mr. W. Forbes (General Manager, London, Brighton and South Coast Railway), in returning thanks, assured the gathering that the railway companies were thoroughly in sympathy with their movement. The companies were perhaps as interested as any of those present in furthering the objects the federation had in view. It was to them a source of great difficulty to give satisfaction to the travelling community in those very few weeks which were now regarded as the holiday period. If the Federation could by any means alter the existing custom so that the holidays might be spread over a greater period they would be relieving the railway companies of an enormous responsibility and give them a great deal more freedom. He himself had been struggling for some time on the South Coast to bring about a co-operation of interests there. They had been more or less successful, but it had been a very difficult and uphill game. He had been loyally supported by his friends in Brighton, Eastbourne, Worthing, Hastings, and many other places represented in that gathering, but it had been a great difficulty to raise a sufficiency of money to do what was the most necessary thing of all, and that was to advertise the charms and the beauties of their seaside resorts. They could do nothing without advertisement. He was sure the chairman would agree with him. The amount of good that was accomplished by constant advertising was surprising. They did a great deal in the way of advertisement, but even then it was nothing to be compared with what was done by the foreigner. He was delighted, therefore, to find that a bill was being introduced into Parliament, by Sir Thomas Roe, to enable towns to advertise and to impose a rate—not exceeding 1d. in the £—for the purpose. What was the good of having trams, water supply, gas lighting, and so forth, if they could not get the people to come to them? It appeared to him, therefore, that Parliament ought to realise this, and he sincerely hoped that Sir Thomas Roe's bill would have the success which it deserved.

Mr. C. F. Graseman (London and North Western Railway) also responded. The North Western had long ago realised the necessity of advertising very extensively. He thought most of those present must have seen their two sea pictures by Mr. Norman Wilkinson, which, he thought, represented a new mode of advertising the railways of Great Britain. They used to get an enormous ship and no sea; now they had a great expanse of sea and hardly any ship. The North Western had done a great deal in connection with North Wales, Central Wales, the Lake District, Scotland, and Ireland. They had come in contact with local bodies, and had spent a good deal of money themselves in helping those local bodies to fill their hotels and their bathing

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machines. He was greatly struck by the phrase used by the chairman when he said that what they had to do was to stand together, act together, and advance together. So far as the North Western was concerned, they were going to do everything they possibly could, with the help of their friends the Press, to encourage this movement. His company would be only too glad to do all in their power in affording facilities to the foreign Press representatives who were soon to arrive in this country. He thought they might adopt an advertisement on revue lines, bearing the words, "Come over here!"

Among the guests were a large number of railway directors, general managers, and other chief officers, the splendidly representative character of the gathering probably emphasising the importance with which the Federation is viewed more strongly than even the remarks made by various speakers.

In the afternoon the delegates of the Federation of British Health and Holiday Resorts met in conference in the council chamber of the Guildhall, for the purpose of inaugurating the federation, and furthering the earlier holidays movement. Mr. John Hinds, M.P., chairman, stated that they now represented sixty well-known resorts, with a rateable value aggregating £9,000,000. One of their objects was to get earlier holidays, and he was glad to see that in Liverpool they intended in future to start their school holidays at the beginning of July. If instead of having all the school holidays throughout the country crowded into six or seven weeks they could double that time, it would be a very great gain. Then, with regard to excursion and touring facilities, all the railway companies were co-operating with them, and the full season railway services would commence this year very many weeks earlier than ever before. One very important matter in which they were deeply concerned was the Health Resorts Advertising Bill. This bill had been many times before the House of Commons. He hoped that before Parliament rose this year the bill would be an Act of Parliament.

Councillor Aveling (Southport) submitted the draft constitution of the federation, in which its objects were thus set forth:

To promote legislation to secure recognition for and to enhance the status of health and holiday resorts, including powers to raise funds from the rates for advertising their attractions.

To undertake, organise, promote, and develop schemes for giving wider publicity and prominence to British resorts, both at home and in foreign countries, and for that purpose to act in conjunction with Government authorities, transport companies, and others.

To aid and promote movements for reorganisation of holidays so as to extend the season over a longer period of the year.

To provide increased facilities for touring in the British Isles, and in particular to improve such facilities from foreign countries both as regards efficiency of travel and economy of fares.

To promote the interest of British resorts at international and other exhibitions, and if and when necessary to promote or to aid the promotion of exhibitions specially designed to further the claims and interests of British resorts.

To organise Press campaigns in British and foreign newspapers and journals and by interchange of visits and courtesies.

To assist in preserving places of historic interest and in improving the amenities and enhancing the attractions of all British resorts.

To organise and conduct schemes of co-operative advertising.

To conduct a Press bureau.

To establish, conduct, organise, and develop a bureau of information, with offices at suitable and convenient centres, for the advancement of the interests of the federation.

To enter into arrangement with tourists firms and other combinations to safeguard and develop the interests of British resorts in all parts of the world.

To organise and improve hotel and other hospitality arrangements at British resorts and to make their attractions and claims more widely known.

The development of the scheme upon which the Federation is embarked will be watched with interest by all concerned in the prosperity of the country. According to a recent statement British holiday-makers spend annually £20,000,000 on European travel, while foreigners who visit this country lay out something like £2,000,000. That this country can offer adequate attractions for the foreign tourist is an undoubted fact; with a longer period and suitable facilities, there can be no question that a considerable number of visitors from abroad will be brought to this country in consequence of this propaganda.

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PERTINENT PARAGRAPHS

The King and the Railway Benevolent Institution.

THE Railway Benevolent Institution Concert at the Royal Albert Hall on Saturday, February 28th, honoured by the presence of the King and Queen, Princess Mary, also the Prince of Wales, Prince Albert, and Prince Henry, ranked as one of the most successful ever held. Every seat in the great hall was occupied, and every box was taken, so that the reception of the Royal party, in the interval between items 7 and 8 on the programme, announced by a fanfare of trumpets rendered by a selection of players in the orchestra, constituted a scene of special significance; while the united rendering of the National Anthem at the close of the concert was exceptionally impressive. The Royal party were received by Earl Howe, President of the Royal Albert Hall Corporation; Lord Allerton, Chairman of the Great Northern Railway; Lord Claud Hamilton, M.P., Chairman of the Great Eastern Railway; and Mr. H. W. Drummond, Chairman of the London and South Western Railway. A guard of honour composed of inspectors and guards on duty with the Royal trains lined the staircase and corridors leading from the Royal entrance to the Royal box, the King regarding the officers with close attention. To the Queen was presented a bouquet of pink roses and white orchids by Miss Hambro, daughter of Mr. Eric Hambro, a director of the Great Eastern Railway, and Miss Mary Martin-Smith presented a bouquet to Princess Mary.

The choir numbered 670, and Mr. W. J. Galloway (Director, Great Eastern Railway), the conductor, obtained magnificent results both with and without accompaniment, while the orchestra of 180 performers also did splendid work. Indeed, notwithstanding the excellence of the solo artists, Miss Ruth Vincent, Madame Kirkby Lunn, Mr. Ben Davies, and Mr. Walter Kingsley, the honours of the evening belong undoubtedly to the railwaymen of the choir and orchestra. The new decriptive work, "The Men on the Line," attracted most attention. The difficulty of writing suitable words for a railway musical work is very great, and can only be realised by those who have endeavoured to do so, and at the same time to avoid the banalities and inaccuracies which usually charactorise so-called railway poetry. Mr. Galloway has done very well in supplying the words, and Mr. Hubert Bath's music therefor is particularly satisfactory.

During the interval the Earl Howe presented to Their Majesties Mr. Galloway, who then presented the principal artistes taking part in the concert: Miss Ruth Vincent, Madame Kirkby Lunn, Mr. Ben Davies, Mr. Walter Kingsley, Mr. Hubert Bath (accompanist); Mr. Cecil F. Grasemann, Chairman of the Concert Committee, assistant to General Manager, London and North Western Railway; Mr. James Wright, manager of the concert, assistant to Superintendent of the Line, London and North Western Railway; Mr. A. E. Mills, M.A., honorary secretary of the concert, and general secretary of the Railway Benevolent Institution; the hon. organising secretaries of the choir and orchestra—Mr. Charles Harley, clerical staff, Railway Clearing House; Mr. A. W. Headley, chief clerk, locomotive department, Great Eastern Railway; Mr. G. G. Smithies, goods manager's department, Great Eastern Railway; and Mr. Reginald W. Tye, superintendent of the line's department, London and North Western Railway. Also the following members of the uniform staff: Mr. E. Adams, motorman, Metropolitan Railway; Mr. C. W. Brown, signalman, London and South Western Railway; Mr. W. Dobbs, signalman, Great Central Railway; Mr. J. Golding, inspector, Great Western Railway; Mr. W. Newman, travelling ticket examiner, London, Brighton and South Coast Railway; Mr. T. W. Tookey, receiving office porter, Midland Railway. Also the undermentioned members of the railway ambulance staff: Mr. W. H. Maunder, Great Western Railway, superintendent in charge of detachment of men on duty at the concert; Mr. F. Draper, Central London Railway, booking clerk; Mr. J. Stone, South Eastern and Chatham Railway, goods guard; Mr. W. E. Trinder, Midland (London, Tilbury and Southend Section) Railway, signal fitter. At the conclusion of the concert the National Anthem was played by the orchestra, one verse being sung by Madame Kirkby Lunn and the chorus by the choir. Their Majesties, on their departure, were conducted to the entrance door by the Earl Howe, Mr. Cecil F. Grasemann and Mr. James Wright.

A large number of railway directors and chief officers were present. The following letter has been received by Mr. W. J. Galloway, from Sir William Carington:—

"The King commands me to forward Their Majesties' congratulations upon the success of last Saturday's concert in aid of the Railway Benevolent Institution. Their Majesties considered the performance reflected the greatest credit on all concerned, and the King and Queen trust the result will be a substantial benefit to the Institution."

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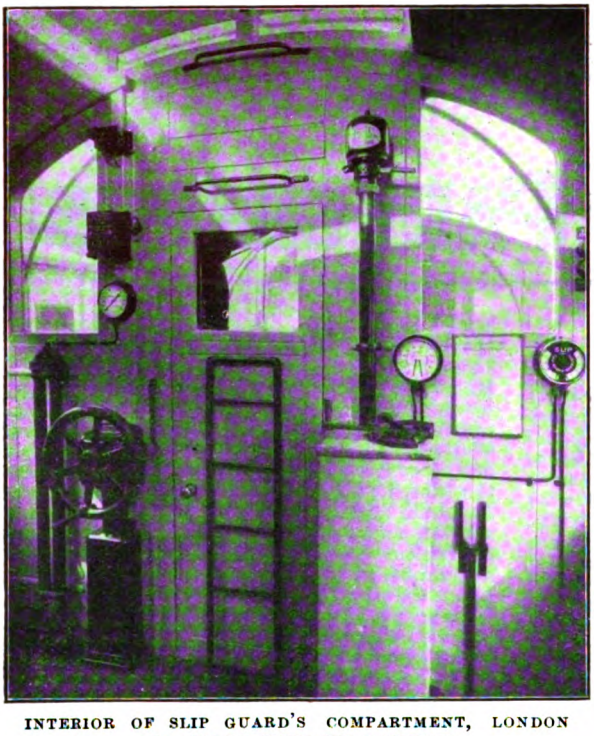

INTERIOR OF SLIP GUARD'S COMPARTMENT, LONDON AND NORTH WESTERN RAILWAY.

Vestibuled Slip Carriages.

One of the great disadvantages of the usual slip-carriage arrangement, is the fact that in the ordinary way passengers in the slip carriages are unable to utilise luncheon and dining-cars on the main train, notwithstanding that for from one-and-a-half to three hours, as the case may be, the slip portion remains attached to the other vehicles. To overcome this drawback the London and North Western Company have now introduced slip vehicles adapted for maintaining communication with the main train until shortly before the slipping station is reached; and they are now being used on the new services given to Coventry by means of vehicles slipped at that station off the 8.40 a.m. breakfast-car and 6.55 p.m. dining-car trains from Euston. Coventry thus obtains improved facilities, and business men using these favourite trains can also utilise the restaurant-car accommodation. Illustrations are given showing the vestibule connections and the interior of the "slip guard's" compartment. The latter has a central door controlling passage through the vestibule, and arrangements are provided to enable the vestibule to be disconnected from inside, as well as for releasing the vacuum brake and steam-heating couplings, and for operating the slipping mechanism.

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Mr. Philip Dawson on Railway Electrification.

A lecture such as that delivered recently by Mr. Philip Dawson is almost unprecedented, seeing that it was given in the large hall at London Bridge station, illustrated with lantern slides, and was presided over by the Earl of Bessborough, Chairman of the London, Brighton and South Coast Railway Company. Among those present were the General Manager, Mr. William Forbes, Mr. C. L. Morgan, Chief Engineer; Mr. H. A. Sire, Goods Manager; Mr. C. A. de Pury, Accountant; Mr. T. N. Wylie, Continental Traffic Manager; Mr. L. Billinton, Locomotive Engineer; Mr. H. A. Walker, General Manager, London and South Western Railway; Mr. W. E. Mandelick, Secretary of the London Underground Electric Railway group. Mr. Dawson spent some six months last year on the Continent of Europe and in America, in making investigations as to electric traction. He referred to the fact that as far as the electrification of main-line railways is concerned progress in Europe has been quite as rapid as in America, something like 2,000 miles of single track having been treated, nearly the same as in the United States. The most important electrification so far carried on was that in connection with the New York-New Haven line, some 70 miles. He had travelled on this line several times at the rate of 70 miles an hour. The traffic in the yards on this line was dealt with electrically, and a high official of the company informed him that so satisfactory had he found it that, though he had been in the company's service something like thirty-five years, if the company were to go back to steam he would quit. He added that he found it safer and quicker and more reliable to work the yards by electric traction than by steam. The New York Central was also electrified over a considerable portion of its system, something like 65 electric locomotives already dealing with the passenger traffic. Mr. Dawson showed what was being done in other parts of America. In Italy electrification on a large scale had been carried out, something like 500 miles of the Italian State Railways having been electrified. In Austria about 300 miles have been electrified; whilst in Germany a considerable amount of money had been spent in this direction, the most important development having been on the Prussian State Railway. Great headway was being made in Switzerland; whilst large developments were taking place in the South of France.

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The Midland Adelphi Hotel in Liverpool.

In the Grand Hotel in Manchester the Midland Railway possesses one of the most remarkable buildings of its class in the United Kingdom, and on March 14th they opened a companion erection, in its way quite as notable, at Liverpool, the new Midland Adelphi Hotel. The building takes the place of the old Adelphi. Entering from Lime Street the visitor passes through the entrance hall into what is known as the court, which is of the most luxurious description. It is based on the finest classic models of the last 200 years, and the scheme of decoration has

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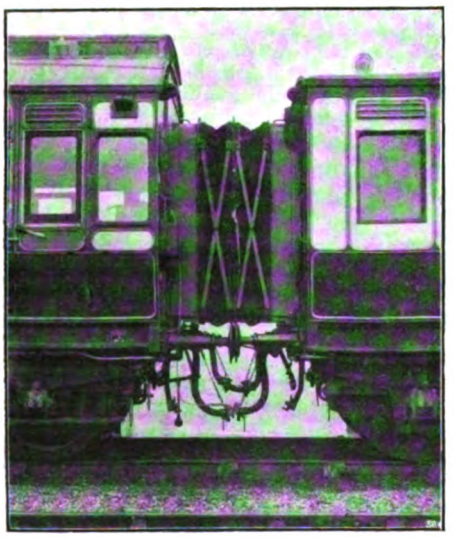
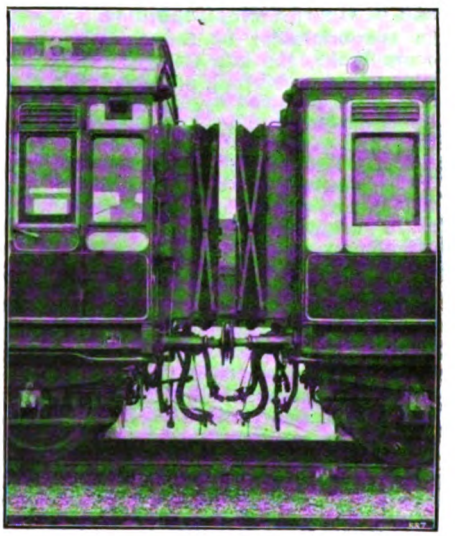
been carefully worked out with an eye to beauty and warmth. Small raised balconettes are arranged on either side of the court and the walls are treated with decorative plaster, with marble pilasters with gilt capitals supporting an ornamental frieze. Leading out of the court are the main public rooms. The drawing room and smoking room are both equally tasteful, according to the character of each, in their decorative design, while the decoration of the dining room has been beautifully carried out in the Louis XIV. style, and there is, in addition, for the accommodation of diners, the French restaurant, a spacious and imposing apartment in the style of the French Renaissance. A special feature is made of the bedroom accommodation. All the rooms, of which there are 400, are quiet and beautifully furnished, nearly every one having a bathroom of its own. There are swimming, Turkish, and other baths, and amongst other interesting novelties introduced is a sports section, where squash rackets, lawn tennis, and rifle shooting can be indulged in.



VESTIBULE AND COUPLINGS CONNECTED.



VESTIBULE AND COUPLINGS DISCONNECTED FOR SLIPPING.

The Late Mr. J. W. Jacomb-Hood.

By the unexpected death of Mr. J. W. Jacomb-Hood, the London and South Western Railway has lost one of its most honoured chief officers. A younger son of Mr. R. Jacomb-Hood, for many years Engineer and later a Director of the London, Brighton and South Coast Railway, Mr. Jacomb-Hood was born in 1850 at Redhill, and educated at Tonbridge School. He then entered the service of the London and South Western Railway as a pupil under the late Mr. William Jacomb, a relative of the family, then Chief Resident Engineer to the Company. His ability was early recognised, and he was soon placed in charge of important works of construction. In 1875 he was engaged with Mr. E. Benedict on the Ryde Pier and Railway works. As District Engineer of the Western district, he carried out, among other works, the construction of the Exmouth and Budleigh Salterton line. After he became Chief Resident Engineer the extension of the Netley line from Fareham to Southampton, the Bentley and Bordon line, the Bulford Camp extension, and the series of widenings from Waterloo to Basingstoke were carried out under his direction. Mr. Jacomb-Hood was also responsible for many other important works, including the re-building of Clapham Junction, Salisbury, Basingstoke, and other stations; but his greatest work was the enlargement and re-building of Waterloo station, still in progress. In 1911 Mr. Jacomb-Hood was elected President of the Permanent Way Institute.

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Charing Cross Improvements.

With the opening of the new Underground booking hall and introduction of escalators to and from the "Bakerloo" platforms, the great transformation in progress at Charing Cross Underground station reaches its first stage of completion. The work has been so exhaustively described in the Railway Magazine for December, 1913, that there is little occasion for detailed reference; but a few remarks concerning the work so far completed will be in place.

To reach the London Electric Railway passengers pass first on to the District platforms, but in due course they will have independent access, though from the same circulating area. Stairways from the District platforms lead on either side to the new Underground booking hall, where automatic machines and booking windows are provided for the use of passengers not holding through tickets. One side leads to the descending and ascending escalators—in separate shafts—which now replace the old access to the "Bakerloo" platforms *vid* a long draughty passage. The escalators leading from the booking hall to the new "Hampstead"

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platform are not at present in use, though one is completed, and for the time being serves as a fixed stairway constituting the emergency stairs from the "Bakerloo" station, being reached by means of the low-level passage which will constitute the connection between the two tube stations.

On the "Hampstead" side finishing operations are still in progress, but all the heavy work is done, and the tube is ready for traffic as soon as the details are completed, and trains will commence to run round the loop on April 6th. The value of this platform, connecting directly with the District and "Bakerloo" stations, will be very great, while its convenience of access for interchange traffic—by escalators to the District station, and by the low level passage to the "Bakerloo" station—will eliminate the walk at present entailed to reach the existing "Hampstead" terminus. Including the three stations at Charing Cross, there will be 234 trains per hour, and over 100,000 passengers will be dealt with daily.

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Death of George Westinghouse.

As the originator of the first practicable pressure brake, the late George Westinghouse will long be remembered, and by virtue of the leading place occupied by the firm which bears his name, his influence has been one of the leading factors in the world's mechanical and electrical industry. Even now, although the vacuum brake is so extensively employed in the United Kingdom, in our colonies and dependencies, and in countries where British practice, Westinghouse equipment is almost universal in America and in Europe, and the number of installations probably exceeds the total of all other power brakes put together. At first George Westinghouse did not have an easy task to introduce his apparatus, and many stories are current concerning those early days; but eventually the air brake received a trial, and justified itself within a few days, and the way was paved for the enormous business which has since been developed. Mr. Westinghouse was also closely associated with the important developments in power railway signalling and electrical engineering, and the various corporations of which he was the founder represent an aggregate capital of about £15,000,000, and find employment for some 50,000 workpeople.

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The Railway as a Profession.

RECENT developments in the railway official world have directed considerable attention to the methods adopted in this country and in America for training the railway officers of the future. A writer in the *Daily Telegraph* has collected particulars of the arrangements in force in the United States and Canada. It has been found necessary to pay adequate salaries *in the earlier stages* of training and in other ways to popularise "railroading" in order to attract suitable men, the tendency otherwise being for the best men to devote themselves to other branches of engineering. He then cites, as a typical example of the kind of training that is offered to the young engineer across the Atlantic who desires to adopt the railway as a profession, the arrangements made by the Canadian Pacific Railway and McGill University. The railway company require that the men for their higher posts should have graduated in the Department of Railways of McGill University. This department is staffed entirely by practical railwaymen, and the full course covers three years. During each yearly vacation three months are spent on the Canadian Pacific Railway, the first three months in the shops, the second in the running sheds, whilst the last vacation before graduating is devoted to road service. Thus, when a man leaves college, he has at least a general idea of what lies before him. He enters at once the employ of the railway company, who have mapped out a further two years' apprenticeship course. This includes six months' track work, and a similar period in the traffic department. Periods of three months each are spent, respectively, in the chief engineer's department, the stores department, the accounting department, and the general manager's office. For each period special report forms are filled up, and these are examined by an official in the general manager's office in charge of the students. The progress of the most promising of the graduates is carefully noted by the general manager himself, so that he is able readily to select the most suitable men for any vacancies that may occur.

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What the United Kingdom is Doing.

ACKNOWLEDGMENT is then made of the good work on somewhat similar lines which is being done on various home railways. In the case of the Great Central Railway a special course of training in all branches of railway work is open to a certain number of the company's high-grade young men who have displayed marked intelligence and ability, and appear likely to be able to profit thereby. This course is longer than that of the Canadian Pacific Railway, extending as it does over 3½ years. During this period six months are spent in each of the following: Engineering department, general manager's office, goods department, locomotive department, marine department, and traffic department. The rolling stock department and the stores department monopolise three months each. After each transference the student is called upon to present a written report of the experience which he has gained in the last department in which he worked, and these reports are commented upon by the general manager.

Other railways have somewhat similar, if less elaborate schemes, involving co-operation between the technical and traffic departments, and between the works and technical colleges, with a view to developing the kind of training required. Prizes are offered, special allowances are made in respect of class time, and other measures are adopted, designed to encourage the attainment of all-round experience instead of merely departmental training. It must not be forgotten, too, that the special railway courses at various universities, the London School of Economics, and other training centres must, in the aggregate, have a very considerable influence upon the development of capable and experienced officers.

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Sir Gilbert Claughton, presiding at the annual meeting of the London and North Western Railway Company, in announcing an increased dividend as the result of last year's working, stated that during 1913 they had had the largest traffics in the history of the Company. By far the greater part of the large increase was, however, in the first half of the year, comparing with reduced traffics in the previous year, due to the cotton and coal strikes, the receipts of the second half of last year being adversely affected by the strike, lamentable from every point of view, including that of the men, of the transport workers in Dublin. The cargo boat service between Holyhead and North Wall was suspended from the beginning of September to December 9th, which, of course, entailed a large loss of revenue. The work in connection with the new line from Willesden to Queen's Park, as well as the electrification of the Hampstead Junction line and the North London Railway, is making good progress, and it is anticipated that by the time the new power house at Willesden is completed—probably in the spring of next year—the other works, including the junction at Queen's Park, will also be ready for the through service to be run to and from Watford and the Bakerloo Railway, at which time it is hoped that it will be possible to commence through electric services between Watford and Broad Street. The work in connection with the remaining electric section, between Queen's Park and Euston, is well in hand, but cannot be opened until some time later. It is expected that electric trains will be running between Willesden and Earl's Court within a few weeks. The alterations at Euston, which include the provision of improved booking office accommodation, re-arrangement of the dining, refreshment, and tea rooms, etc., are in progress, but work has been suspended for some weeks owing to labour trouble in the building trade. The new tea room and first-class refreshment room have been completed and brought into use. The additional offices over the east and west wings are nearly finished. The cast-iron tunnels at Kensal Green and Chalk Farm have been commenced, and the bridges under the public streets are well in hand. Additional platforms have been provided at Broad Street and Bricket Wood stations. A down loop at Welton and up loops at Weedon and Stafford have been completed and brought into use, and up and down loops are now being constructed at Foleshill on the Coventry and Nuneaton line. The sleeper creosoting depôt at Mitre Bridge, Willesden, is inconveniently placed and restricted in area, and it is necessary to transfer the works to a more central position. Suitable land has therefore been purchased at Northampton, and the construction of the new depôt is in hand. The permanent way of the new railway at Coventry is being laid, and it is expected that the line will be opened for traffic during the coming summer. Alterations at Walsall passenger station are complete, and the large shed for empty packages at Aston goods station, Birmingham, is nearly finished. At Earlestown, the wagon works are being extended by the building of a new wagon shop, brass foundry, and turning shop, and at Edge Hill station, Liverpool, a reinforced concrete gantry and bunkers are being constructed to facilitate the coaling of locomotives, the work being in an advanced state. A contract has recently been let and the works commenced for the widening of the Chester and Holyhead Railway between Abergele and Llandulas, which it is expected will be opened during the present year. New sidings and landings are being provided at Abbey Foregate, Shrewsbury, for the traffic in connection with the Royal Agricultural Show to be held at that place at the beginning of July next; portions of the sidings will be retained and form part of a permanent scheme of loops and sidings, designed to give increased facilities for dealing with the ordinary traffic.

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Good progress is reported by the Great Western Railway in reference to the new lines in course of construction, the Ealing and Shepherd's Bush Railway, the section of the Wolverhampton and Bridgnorth Railway between Wolverhampton and Kingswinford, and the Clydach Pontardawe and Cwmgorse Railway. The Swansea District lines have been opened throughout for goods and mineral traffic and the doubling of the West Cornwall Railway between Penwithers Junction, near Truro, and Chacewater is nearly complete. A contract is about to be let for the construction of the Trenance Valley Branch in the vicinity of St. Austell, authorised in 1910 and required for dealing with the china clay traffic. The new station at Snow Hill, Birmingham, has been completed and the works at Moor Street are progressing satisfactorily. A further section of the widening of the railway south of Birmingham has been completed and steps are being taken to continue the widening from Olton to Widney Manor. The works in connection with the extension and improvement of Paddington station are considerably advanced, certain of the additional accommodation having been brought into use with substantial advantage to the conduct of the traffic at the terminus.

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PRINCIPAL interest afforded in the Chairman's speech at the Midland Railway shareholders' meeting relates to the affairs of the London, Tilbury and Southend section. Under the Act by which the Tilbury line was purchased, the Midland Company is under the obligation to electrify that section, and in order to carry out that obligation it is necessary to widen the line between Stepney and Gas Factory Junction, and between Barking and Upminster. Powers are being applied for to construct two additional lines between Stepney and Gas Factory Junction points, and to carry on these lines to join the Tilbury line at Bromley station, crossing the Great Eastern Railway and the North London Railway by a fly-over junction. The length of this new line is 1½ miles, and is all on viaduct. From Bromley to Barking there are four lines, but from Barking to Upminster there are only two lines, and this section of 7¾ miles is to be made four-track, with a curve at Hornchurch to give a junction towards London for the Romford branch line. Powers are also being sought to take over the Tottenham and Forest Gate Railway—a short length of line of 6 miles on which trains run going from St. Pancras to the Tilbury line. This used to be joint between the Tilbury Company and the Midland Company, so that it is now practically Midland. It is, therefore, rather superfluous that it should any longer be kept as a separate entity, with directors, secretary and staff.

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GOOD progress in all departments is recorded by the London and South Western Railway, gross and net receipts showing notable increases, while the dividend for 1913 is appreciably higher than that paid on account of the year's working during 1912. The engineers and contractors are now busily engaged in remodelling the northern side of Waterloo station. As regards Southampton, the building of the new White Star dock and enlarging of the new Trafalgar graving dock have been completed with the exception of a few small items, such as sidings and auxiliary sheds. Since the opening of the Trafalgar Dry Dock it has been practically in constant use, and by means of the new caisson the dock can be used either as an ordinary dry dock or as a wet dock. There may be a drop in the tide outside of 13 or 14 ft., yet inside the dock there is from 35 to 40 ft. of water, and a vessel can lie and unload or load as if she was lying alongside an ordinary quay, so that this dry dock comes in for double utility purposes. Cunard services between Southampton and Canada show very satisfactory traffic increases, and new and much larger steamers are being used therefor this year. The *Britannic*, the new White Star liner launched a few weeks ago at Belfast, will be domiciled at Southampton, and the Hamburg-Amerika and other German lines are developing in ways which will bring yet further traffic to the London and South Western Railway. An important new traffic is brought by these steamers, which was commenced last year with the *Imperator*. Between Southampton and Cuxhaven the voyage occupies somewhere about 19 hours. As Cuxhaven is within about five hours' journey of Berlin, there will be very few hours' difference between this and other routes to Berlin.

THE London and South Western Railway takes a leading position as regards the electric lighting of passenger carriages. Those vehicles which are still lighted with gas are being fitted with safety valves which automatically close the cylinders in the event of the gas pipes leading therefrom being broken and causing any serious leakage. The company have also decided to employ nothing but steel for bogies and underframes of coaches. In new vehicles steel is being used instead of wood for panelling. The foundations at the main power house at Wimbledon are all completed, the big chimney-stacks are in a forward state, the superstructure in course of erection, and it is hoped that within three months the boilers for the central station will be in position. The contracts for the substations have been let, work has been commenced, a contract has also been placed for the whole of the electrical machinery, and out of the 144 miles of conductor rail required in connection with the first stage 100 miles have already been delivered and 20 miles are already fixed and in position. Out of 77 miles of high tension cables required, 25 miles have been delivered, and 17 miles fixed and connected up.

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FAVOURABLE increases in nearly all branches of traffic are recorded by the Great Central Railway Company. The works in connection with the construction of the railway deviation, and the new railway and highway bridge over the River Trent at Keadby are progressing satisfactorily. The Darnall Tunnel has been opened out, and a portion of the widened line brought into use; the remainder of the widening is proceeding. Substantial progress has been made with the widening of the railway between Wrawby Junction and Brocklesby. A contract has recently been let for the widening of the line between Doncaster and Thorne, and the work is now rapidly progressing. The work in connection with the improved ventilation of Woodhead Tunnel is in hand, and one of the shafts will shortly be completed. An extension of the Fish Market at Grimsby Docks, together with additional siding accommodation, has been authorised, and the work is proceeding. Anticipations in regard to traffic at Immingham have been fully realised. The exigencies of the business have necessitated the provision of a commodious wool shed, which is nearing completion, and as the vessels carrying wool also bring to this country a large quantity of meat and other perishable articles, it is essential that suitable cold storage accommodation should be provided, and this matter is under consideration. It is expected that the new lines of the Hull and Barnsley and Great Central Joint Companies between Gowdall and Braithwell will be sufficiently completed to enable them to be opened for traffic within the present year. The new cargo steamer *Chesterfield*, recently built by Messrs. Swan, Hunter, & Wigham Richardson, on the Tyne, has been placed in the Rotterdam-Grimsby trade. A sister ship, the *Macclesfield*, will be delivered by the same firm in May.

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PASSENGER traffic on the Furness Railway continues to make satisfactory progress, showing last year the large annual increase of about £45,000 compared with 15 years ago. 515,705 more passengers were conveyed during 1913 than

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in 1912. The steamboats have also done remarkably well. On the Barrow and Fleetwood service 179,000 passengers were carried during the 1913 season, an increase of 42,000 passengers—30 per cent. advance. The lake steamers (Coniston and Windermere) also show the very satisfactory increase of 53,000 passengers—20 per cent. advance. Goods traffic has also been satisfactory, particularly during the June half-year, an increase of 528,000 tons, principally in coal and coke and other mineral traffic, being recorded. The Leven and Kent Viaducts are being reconstructed. These viaducts were built in the year 1857, and they have done good service in the 56 years that have elapsed since that date. When the work is completed trains will be able to run over them without being restricted in speed. Widening of the Walney Channel and Piel Bar has been completed, which will now enable the largest battleships and battle cruisers to pass safely in and out of the Barrow Docks. Messrs. Vickers, who have contributed to this expenditure, were able, owing to these improvements in the Walney Channel, recently to safely undock the Japanese battleship *Kongo*, the largest vessel which has been built at Barrow.

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THE first of the new 2–8–0 goods engines built at the Derby works of the Midland Railway to the designs of Mr. Fowler, the chief mechanical engineer, for the heavy mineral traffic on the Somerset and Dorset Joint Railway, reached Bath on March 1st. These engines are the heaviest yet seen on the Somerset and Dorset line, weighing 70½ tons without the tender. The weight on the coupled wheels, which are eight in number, is 62 tons. The engines have eight coupled wheels, 4 ft. 7½ in. in diameter, and a leading two-wheeled "Bissell" truck, with wheels 3 ft. 3½ in. in diameter. Outside cylinders are provided, and the valve gear, located outside the frames, is of the Walschaert pattern. Other features new to the Somerset and Dorset line are a Belpaire fire-box and a Schmidt superheater. The order is for six of these engines. The first is numbered "80." She is painted black and the number is painted on the sides of the cab, instead of being shown in brass figures. Owing to the exceptional dimensions of these engines, there is at present no turn-table on the Somerset and Dorset line of sufficient length to accommodate them, and a double cab is therefore fitted for the protection of the driver and fireman when the engine is running tender first. For the same reason, the apparatus for exchanging the tablets used in single-line working is fitted to both sides of the tender.

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OWING to the unavoidable absence of Mr. C. J. Allan, a debate was arranged in place of the paper announced for the meeting of the Railway Club on Tuesday, March 10th, and the following motion was submitted for discussion: "That in the opinion of this Society, the four-coupled type of express locomotive in the British Isles is more successful in daily work over heavy gradients than the six-coupled." The motion was proposed by Mr. B. M. Bazley and opposed by Mr. A. W. Bartlett. An animated discussion followed, and the meeting accepted the motion by a majority of four votes. It is hoped that Mr. C. J. Allan will be able to give his paper at the May meeting. On April 21st Mr. H. L. Hopwood will read a paper on the Midland and Great Northern Joint Railway. Nineteen London members of the Railway Club met at Fenchurch Street station on Saturday afternoon, March 14th, and travelled to Custom House station for the purpose of visiting the Nippon Yusen Kaisha steamship *Miyazaki Maru* at berth in the Victoria Docks. With charming courtesy the Japanese officers conducted the party over the well-fitted vessel. The keynote of the passenger quarters appeared to be comfort combined with artistic taste. Scrupulously clean were kitchens, cabins and saloons. After the company had been entertained to an exquisite Japanese tea, the engine rooms were inspected with considerable interest. Mr. Wade, the Nippon Yusen Kaisha London passenger superintendent, was present during the afternoon, and received through the Club's Secretary and President thanks for the hospitality so kindly provided.

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CHEAP excursions are announced from London (Euston and St. Pancras) for 5, 6 or 8 days to the pleasure resorts on the Furness Railway on Thursday, April 9th. Excursions will also be run and Week-end, 10 and 11 days, and Tourist Tickets issued from the principal towns in England to Furness coast stations and to Furness Abbey. An extended service of steamers will be run on Windermere Lake during the Easter Holidays, and passengers may travel at single fare and a quarter between all stations on the Furness Line. Special mention should be made of the excellent golf courses on the line, those at Ulverston and Seascale being amongst the finest in the country.

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THE first annual concert of the head offices' staff of the Metropolitan District, London Electric, Central London and City and South London Railways, was held on Tuesday, March 10th, in the large hall at the Cannon Street Hotel. Mr. A. H. Stanley, Managing Director, was announced to take the chair, but was prevented by illness, his place being taken by Mr. W. E. Mandelick, the Secretary. During an interval the Chairman read a letter from Mr. Stanley regretting his inability to be present, and referring to the phenomenal development in Underground traffic and in the facilities now afforded by the four railways concerned and associated lines and travel agencies. He also expressed his appreciation of the way in which the staff co-operated with him. Mr. Mandelick mentioned the fact that the District Railway was incorporated in 1864, and that the Baker Street and Waterloo line was partially opened exactly 8 years ago, on March 10th, 1906. Lord Farrer, one of the Directors, followed, referring to the fact that the number of passengers conveyed had already exceeded the mileage between the earth and the sun, and would soon provide for a journey to Mars on the same basis. A new "National Gallery" had been given to London by means of Mr. Pick's now famous posters, and in every way the "Underground" was going ahead. After the interval a special "Underground" turn was given by the publicity department, including an exhibition of Tony Sarg pictures, and cinematographic films from Earl's Court to Ealing, taken from the back of a train, and from Harrow to Park Royal from the front, with a humorous item dealing with the Earl's

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Court Exhibition. The gathering included about 350 members of the staff and visitors, among the latter being many chief officers from nearly all the leading railways in London, and some of those in other parts of the country.

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A SERVICE of non-stop trains between Baker Street and Harrow was put in operation on the Metropolitan Railway on March 2nd, and the time occupied by the journey between these two stations was reduced to 17 min. During the busy portions of the day some 30 non-stop trains now run direct to and from the City and the charming regions which lie at and beyond Harrow, and the new service is greatly appreciated. Owing to the necessity which has hitherto existed of having to work the whole of the Harrow line traffic over one pair of tracks, it has only been possible to run two trains up in the morning and one down in the evening between Harrow and Baker Street without stopping intermediately. This new fast train development on the Baker Street-Harrow section of the Aylesbury line is due to the doubling of the electric railway track, now, with the exception of the works of the Kilburn Viaduct, completed. The general train service on this section of the Metropolitan Railway has been greatly augmented, and now close upon 1,500 trains use Baker Street station daily.

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THE ninth annual dinner of the Chief Goods Manager's Staff of the Great Central Railway was held at the Hotel Great Central on Friday, February 27th, when one of the most successful gatherings of past and present members was presided over by the Chief Goods Manager, Mr. J. Rostern. Mr. Rostern, in an interesting speech, contrasted the receipts of the company with periods 30 and 60 years ago, and alluded to the fact that the Great Central Company had for some time past been one of the main trunk lines of the country instead of merely a cross-country line. He also alluded to the consistent and steady progress made during the last few years, and which would, he thought, have been absolutely unbroken were it not for the untimely coal strike in 1912. The motto of the company was "Forward," and they had progressed in keeping with their motto.

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ON the occasion of the Holy Week in Rome, the Continental and English Railways have arranged to issue, by specified trains, on April 2nd and 9th, cheap tickets for independent travel, available 33 days from London; the highest return fare from London to Rome, *viâ* the Mont Cenis route is £10 4s. 9d., 1st class, and the lowest is £4 13s. 2d., 3rd, class. The Riviera route can be chosen at a slightly increased cost. Full particulars and conditions are to be found in a leaflet obtainable from the Paris, Lyons & Mediterranean Railway Offices, 179, Piccadilly, London, W. Applicants should mention the RAILWAY MAGAZINE.

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WITHIN easy reach of London, Southampton, Portsmouth and the Midlands of England the New Forest in spring forms an ideal holiday haunt for the jaded city man. The popularity of the district is growing rapidly, much attention having been drawn to it by the excellent pictorial poster issued last year by the London and South Western Railway. Lyndhurst Road is the best station to use in visiting the great Hampshire woodland, and good accommodation may be obtained at the Crown Hotel, a famous hostelry situated facing the south in the best part of Lyndhurst, the village capital of the New Forest.

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THE Lancashire and Yorkshire and North Eastern Railway Companies' joint steamship service between Hull (North Eastern Railway Riverside Quay) and Zeebrugge will be resumed for the 1914 season as under:—May 30th to June 25th: Hull, depart Wednesdays and Saturdays; Zeebrugge Quay, depart Mondays and Thursdays. June 27th to October 2nd: Hull, depart Tuesdays, Thursdays, and Saturdays; Zeebrugge Quay, depart Sundays, Wednesdays, and Fridays. The service will be maintained by the twin-screw steamer *Duke of Cornwall*, in place of the *Duke of Clarence*, hitherto employed. Boat trains to and from Hull (North Eastern Railway Riverside Quay), and between Zeebrugge Quay, Bruges, Ghent, and Brussels will be run.

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WITH a view to encouraging the earlier holiday movement, the Great Eastern Railway have arranged some important improvements in train services from April 1st. Amongst these may be mentioned a new breakfast car express from Liverpool Street at 8.23 a.m. and an additional mid-day express at 1.30 p.m. every week-day. These new trains will serve Clacton, Frinton, Walton-on-Naze, Norwich, Yarmouth, Lowestoft, Cromer, Mundesley and Overstrand. The latter train will also give a connection with Sheringham during May and June. Additional expresses arranged at convenient times have also been provided for the return of visitors from the coast resorts to London. Commencing on July 1st, a new dining car express will be run from London to the popular coast resort, Hunstanton. This train will leave Liverpool Street at 11.50 a.m., returning from Hunstanton to Liverpool Street at 5.37 p.m.

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THE directors of the North Eastern Railway have arranged that Mr. R. L. Wedgwood shall, in addition to his duties as Chief Goods Manager, assume control of the work of the Passenger Department, rendered vacant by the retirement of Mr. Philip Burtt.

* * *

Train alterations on the London and North Western Railway announced for April relate principally to additional rail motor services, including the Carnarvon-Llanberis section, further facilities between Llandudno and Bangor, and between Ruthin, Denbigh and Mold. We are asked to state officially that Sir Robert Turnbull, M.V.O., has been appointed General Manager, in place of Sir Frank Ree, deceased. Communications formerly addressed to him as Superintendent of the Line, should be simply addressed: "Superintendent of the Line, London and North Western Railway, Euston Station, London, N.W."

* * *

On June 26th, their Majesties the King and Queen will visit Hull, for the purpose of opening the new joint dock of the North Eastern and Hull and Barnsley Railway Companies, which has been eight years under construction, at an estimated cost up to the present of £2,750,000.

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The Papers of a Railway Company.

By A RAILWAY CORRESPONDENT.

At the present time it is generally known that Railway Companies (and sometimes different sections of the same Railway) have a totally different method of dealing with the filing of correspondence, return forms, etc., with the result that a member of the staff who is transferred from one station to another is some considerable time before fully grasping the details of a system with which he should be familiar. This means loss of money to the Company employing him. Go into the average Railway Office, not immediately under the supervision of the heads of the Company and you are at once struck with the untidy state of the office generally; papers, here, there and everywhere: chaos and confusion reigning supreme. When an order is given to turn up any given set of papers, though of comparatively recent date, it means a junior clerk, spending some time in hunting for the necessary documents in various cupboards and drawers. When, after much trouble, they are produced, they are usually covered with dust and with "dog-eared" corners and with the back sheets either missing or torn.

All this can be obviated. Papers years after, ought readily to be turned up with the greatest ease and in clean condition. It can be done. How? (read on) . . . .

Take the Administrative departments, the General Manager's, Goods and Traffic Managers', the adoption of a workable simple system is both possible and advantageous. Letters received of a morning could be sorted into various sections 'distinguished by a colour of File' and then taken to the different offices for dealing with. By carbon duplication of letters at time of typing the reply to a letter can conveniently be filed next the letter itself and this would abolish the antiquated system of copying letters in tissue books. Colours and numbers might be brought into use to indicate the different railways or sections of the work and the filing of return forms, etc., effectually accomplished by using files of special size or shape.

In locomotive, stores and other departments of various railways such a system is to-day in use and giving great satisfaction.

In Goods Offices particularly the adoption of these Files—of different colours, different sizes and each with a strong binder would prove a great boon, either for use separately in "Received," "Forwarding," "Accounts," or "Shipping" Offices or jointly, a different coloured file or different coloured band subdivision being used for the sections of the work.

The filing of the various forms used, for instance, in a Goods Office and which are frequently enquired for, for after inspection, could be dealt with in this way and with success. It would be found a vast improvement upon the haphazard method at present in operation, viz., of tying into bundles and stacking away in a cupboard. It has been proved in practice that batches of papers may be sent conveniently from station to station, held securely in the patented files (and if necessary, placed in a leather case, specially made to hold the files) with a maximum of expediency and a minimum of trouble.

The System may also be advantageously employed in Parcels Offices, for filing documents and in Booking Offices for keeping circulars, handbills and railway announcements.

In a word, the adoption of the system—and I now mention it—the Stolzenberg System of Filing with its unique classification by colour would yield a percentage of profit in saving of clerks' time, commensurate with the slight, if any, extra expense, whilst it would conduce to Cleanliness and Order, and in addition, finally facilitate the rapid transaction of Railway Companies business.

Needless to say it is a system welcomed by the clerical staff of a Railway with delight.

* * * * *

The confidential papers in the private office of the Principal are best kept in a filing cabinet fitted with a dust-proof roller shutter and lock.

* * * * *

A good Reminder Book relieves you of the worry of memorising future engagements. A very suitable one can be had costing but 15s. It is practically a perpetual diary.

* * * * *

The "Ready Sorter" reduces the time taken for filing letters, no matter what system is used. It prevents the letters from falling into disorder during the sudden absence of the filing clerk.

* * * * *

Stolzenberg specialities are worth knowing. The Coy's showrooms are at 210-212, Bishopsgate, E.C.

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The Stolzenberg System of Filing is in use in Railway Offices in all parts of the World.

In every office nowadays it is necessary to keep all papers in proper order. Where there are large numbers of clerks who are constantly handling various documents it is quite an easy matter for the papers to get out of order. The question therefore arises, which is the best way to

KEEP YOUR

correspondence. The Stolzenberg system of filing is an "Individual" System, and is a great improvement on the Vertical method. Stolzenberg is worked with the aid of a colour scheme. It is quite easy to divide the correspondence of an office into, say half a dozen sections; to each of these sections a colour is allotted. The first unit of Stolzenberg is the jacket or file, made of various coloured manillas, which binds the papers in a

PERMANENT WAY

The files—and each contain the papers relating to one matter ONLY—are stored horizontally and divided into very small sections by colour classification. The files are stored in cabinets which divide the files into sections numbering from 12 to 20. Reference is thus easily made as the divisions are again divided by the files of various colours, containing the papers relating only to the matter with which you are concerned at the moment, and by means of the binding mechanism you can rely on finding the contents

IN PROPER ORDER

If you wish to have further particulars of the Stolzenberg system, kindly write for catalogue No. 46.

The Stolzenberg Patent File Co., Ltd.,

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LONDON & NORTH WESTERN RAILWAY:
LIVERPOOL AND MANCHESTER LUNCHEON CAR EXPRESS LEAVING EUSTON.

Published by "THE RAILWAY MAGAZINE."
Photograph by F. E. Mackay.

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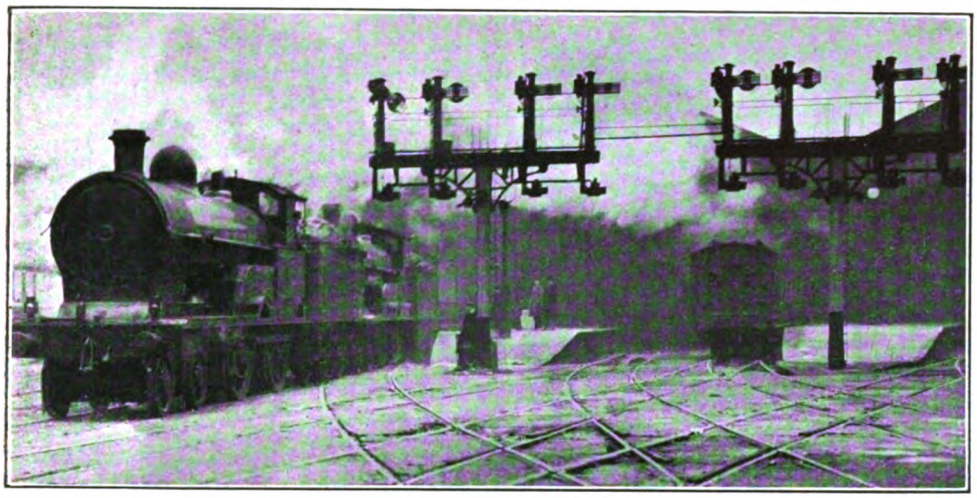

Photo] [*F. E. Mackay.*

MANCHESTER EXPRESS LEAVING PLATFORM NO. 6.
4–4–0 superheater locomotives *Nubian* and *Saddleback.*

The Most Famous Railway Station in the World: Its Traffic and Associations.

EUSTON—LONDON AND NORTH WESTERN RAILWAY

By BASIL MERCER.

IT is a curious fact that the three largest terminal stations in London are extensions from the original scheme of construction. The London and South Western terminus was at first situated at Nine Elms; it was not until 1874 that the Great Eastern extended its metals from Shoreditch to Liverpool Street; and at first, though new arrangements were made before construction was well advanced, the London and Birmingham Railway was intended to terminate at Chalk Farm instead of Euston. It was, however, early realised that it would be a good thing to have the terminus as near the centre of London as possible, as will be seen from the following extract from the report issued in the year 1835:—"The Directors, believing that it would be for the interest of the Company that passengers by the railway should have a nearer access to the Metropolis than is afforded by the station at Camden Town, caused surveys and estimates to be made of a line, which the Engineer recommends, about a mile in length and without a tunnel, from the present terminus to Euston Grove." The step taken by the Board in 1835 was not only very wise but remarkably courageous when the situation then existing is reviewed. Just south of Chalk Farm the London and North Western Railway crosses the Regent's Canal; a fair headway for the water traffic had to be provided, which entailed a somewhat heavy gradient from the new terminus at Euston to the canal bridge. It must be remembered that at that time the steam locomotive was almost in its infancy, and to work trains over such a grade would have been far beyond the powers of the engines of the period. Indeed, the Camden bank taxes even the powerful locomotives of to-day when the train is heavy. Therefore, it was necessary at that period to draw trains to the summit by means of haulage cables operated by stationary engines, and it was not until some years later that locomotives worked the trains from the terminus, with or without assisting engines. The incline at the present

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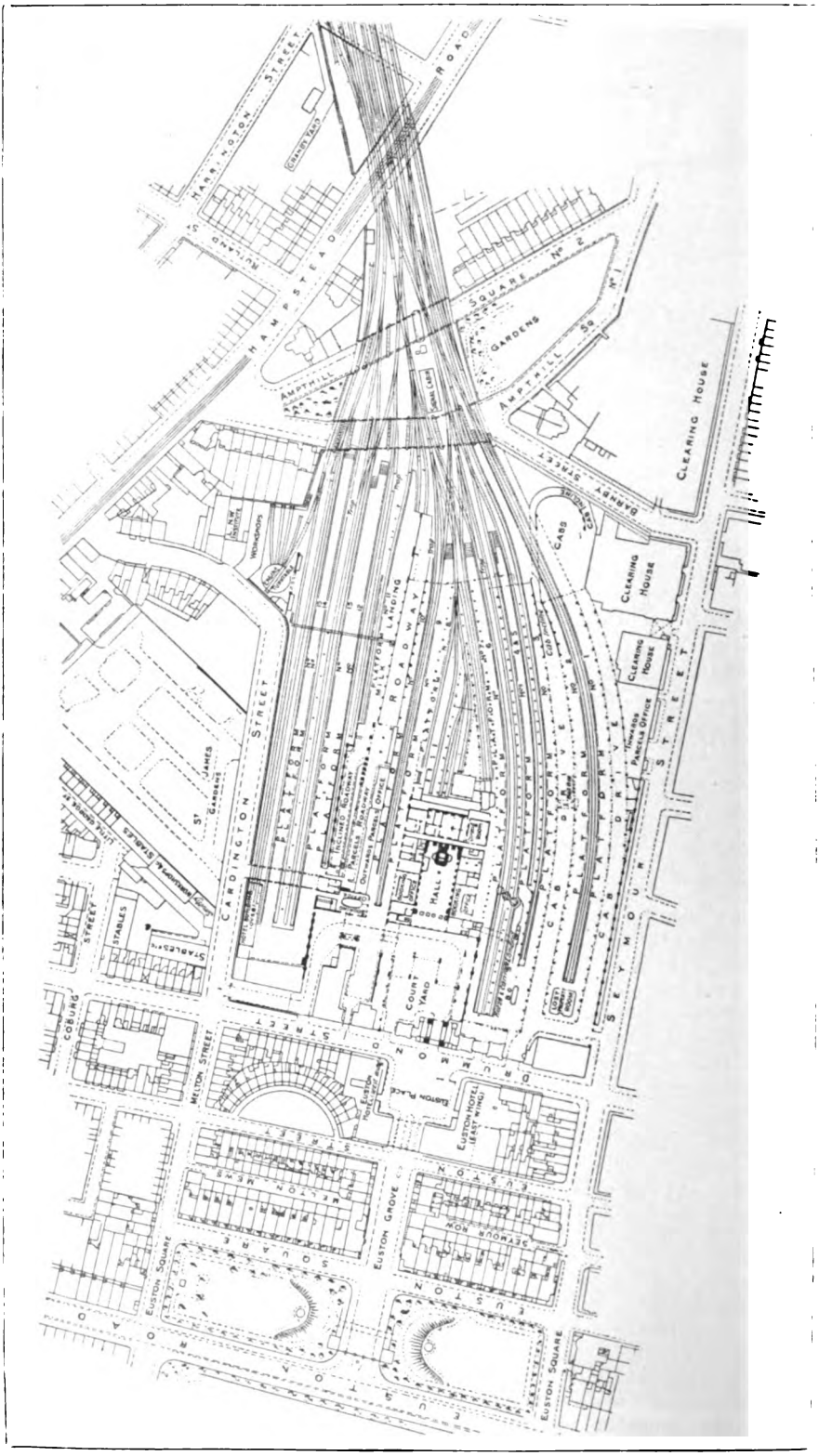
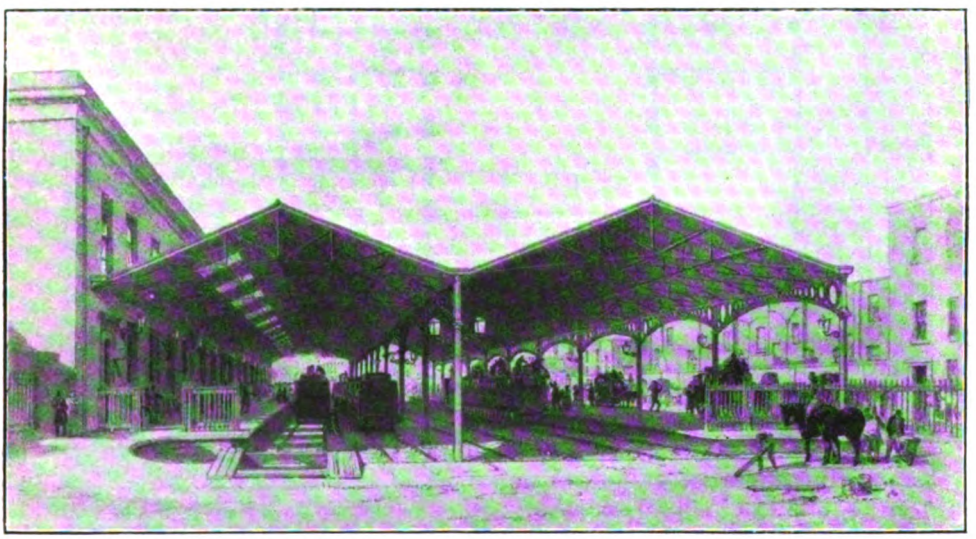

HAMPSTEAD ROAD
HARRINGTON STREET
MUSEUM ST
CRANFORD MEWS
AMPTHILL SQUARE
AMPTHILL SQ. GARDENS
No 2
No 1
BARNBY STREET
CLEARING HOUSE
CLEARING HOUSE
CLEARING HOUSE
CLEARING HOUSE
CASS
CAMDEN STREET
ST JAMES GARDENS
STABLES
STABLES
COBURG STREET
MELTON STREET
EUSTON GROVE
EUSTON SQUARE
EUSTON SQUARE
EUSTON HOTEL (LEFT WING)
COURT YARD
HALL
PLATFORM
PLATFORM
PLATFORM

time consists of virtually a mile of 1 in 77, which is not an easy start for a heavy express with a sharp booking.

The approach to Euston station is imposing. The station is reached by a wide road flanked by the Euston Square gardens, and two lodges, "East" and "West," meet the eye of the passenger as he turns in from the Euston Road. Straight ahead is the central block of the Euston Hotel, under which two roadways lead into another square. The famous Doric portico is now in sight, and, passing under this, one arrives in the glass-roofed courtyard of the terminus. A hasty inspection of the great stations in this part of London is apt to give the impression that St. Pancras alone possesses the practical man. The Great Hall, built by Philip Hardwick, forms a unique example of railway station waiting-room accommodation, at any rate on a British railway. It is a noble building, 137 ft. long, 62 ft. wide, and 62 ft. in height, and possesses a flat panelled ceiling, said to be the largest of the kind in the world, and copied from the celebrated roof of St. Paul's-Outside-the-Walls at Rome. At the north end of the hall there is a statue of George Stephenson, and behind this is the beautiful staircase leading to the Board Room and Shareholders' Meeting Room. A gallery round the hall gives access to various offices, which appear to extend in all directions therefrom, on first floor level and above. The Shareholders' Meeting Room is also a



ARRIVAL AND DEPARTURE "SHEDS" AT EUSTON STATION IN THE EARLY DAYS.
(*From an old print in the possession of the London and North Western Railway.*)

features of architectural interest: this, however, is not the case. One must not forget that the Midland station is of one single design and period. Euston, on the other hand, is some thirty-five years older, and has been twice enlarged since St. Pancras was opened. The effect of the Doric portico, a magnificent example of classical stonework, is now somewhat spoilt by the necessary extension of the hotel building. Formerly there were two entirely separate structures, but the increasing demand for accommodation necessitated enlargement, and the view which was once presented is lost to the generation of to-day.

There are, however, several other features which are of interest alike to the artist and fine apartment, similar in shape to the main hall. It is built in the style of the Italian modern school, a beautiful feature being the fine marble pillars, arranged in pairs, supporting the roof. Smaller than either of the foregoing, the Board Room has one or two features that call for remark. The magnificent centre-flowers in the ceiling, composed of groups of fruit in plaster-work, most beautifully coloured, is a fine example of a kind of decoration that is rare in these days. The mantelpiece, of sculptured marble, is a work of great beauty, while the large oval table at which the business of the Directors is transacted is of yellow pine, mellowed to an attractive colour by age, and supported on massive carved legs of artistic design.

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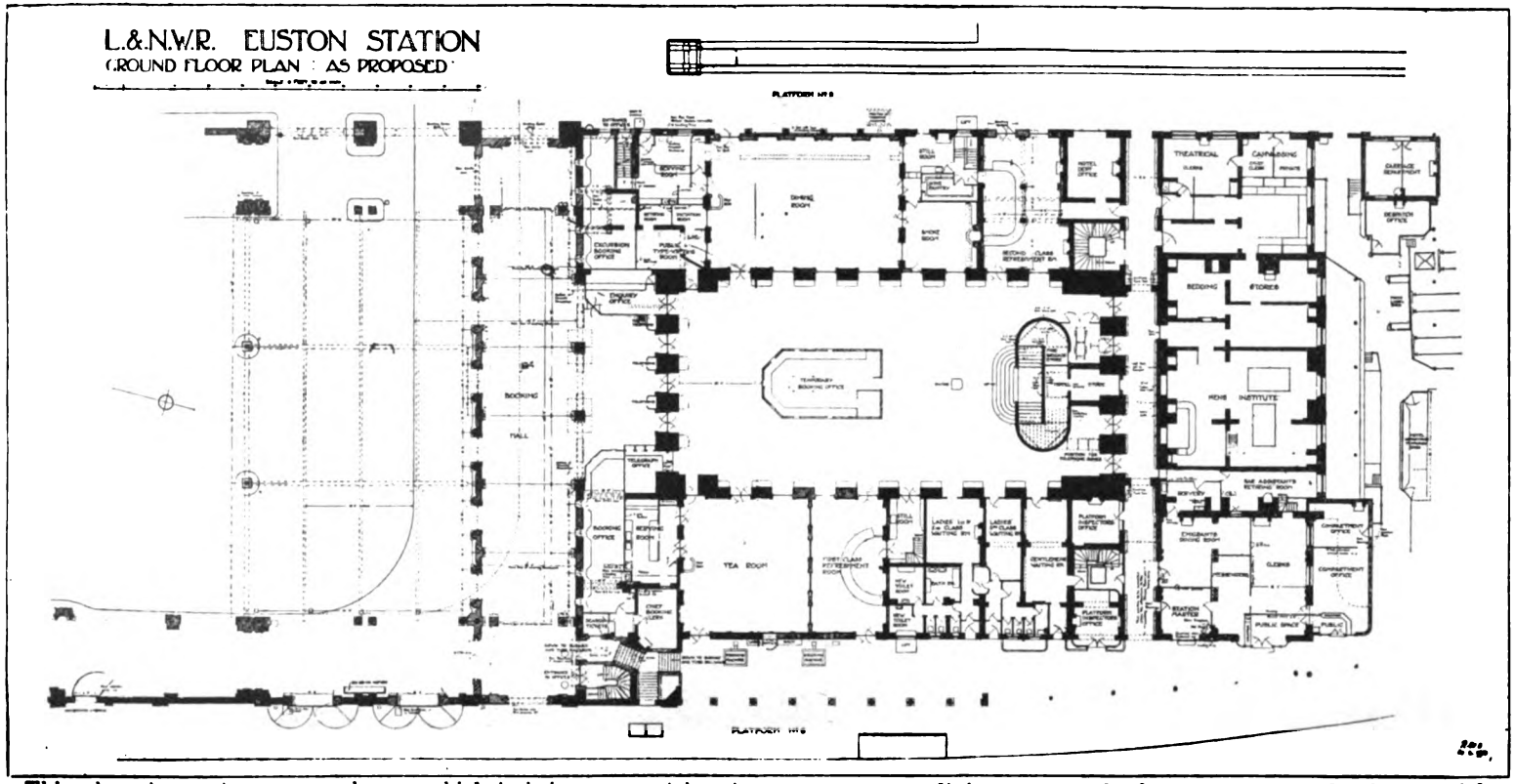

This plan shows the courtyard area which is being covered in, the new tea room, dining room, refreshment rooms, and other special accommodation associated with the reconstruction, together with the new booking hall, though the present temporary booking office in the grand hall is also indicated. The institute for the uniform staff is below the shareholders' meeting room.

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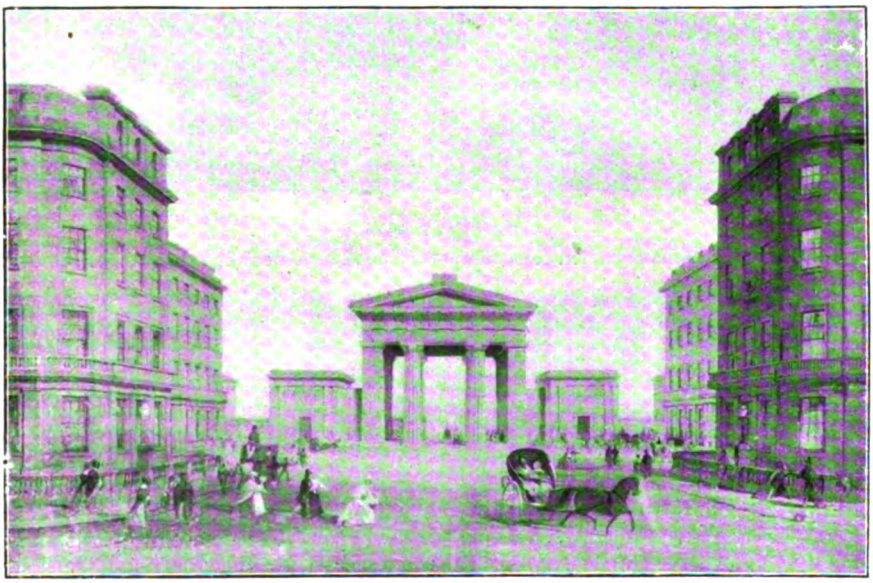
Adjoining these rooms are private luncheon and reception rooms, whose walls are graced by portraits and old pictures, many of great historical interest, showing as they do the "men and machines" of the early days of "the oldest established firm in the passenger business."

Euston Hotel, though it lacks the architectural pretensions of some railway hotels, leaves nothing to cavil at in its arrangements. Comfort is studied rather than display, and the fact that English waiters are employed ought to gladden the heart of every Englishman, for patriotic reasons, apart from the fact that, in the writer's opinion at any rate, the resulting service is better.



THE FAMOUS PORTICO AND ACCESS TO EUSTON STATION FROM EUSTON ROAD IN THE EARLY DAYS.
(*From an old print in the possession of the London and North Western Railway.*)

Euston is one of the oldest stations in the country, and it is interesting in these utilitarian days to find that some of the original parts of the structure have escaped demolition. Passengers who are not in too great a hurry may have noticed the colonnades on platforms 6 and 9. These pillars, in common with some of the adjacent buildings, are part of the original station. The roofing over the platforms includes some of the original work, and subsequent enlargements have been designed in the same manner, so that the general effect is preserved. This type of glazed roof was the first example of an iron roof constructed on this principle; it is at once economical and satisfactory in every other respect, and so has been continued until this present time. It has not the fine span, either arched or flat, that is presented by St. Pancras or the new Waterloo, but it is well suited to the purposes of a railway station and has the further advantage that extensions are very conveniently made when enlargement is required.

In 1838 the accommodation for trains consisted of two platforms. Various additions and extensions were made to it from time to time, until it had grown from the original two acres to ten in 1870. More room, however, was needed, so the station was carried right up to Seymour Street, on the eastern side, in 1874. This addition, supplementing the area of the station by three acres, made Euston one of the largest stations in England; but, in Queen Victoria's Jubilee year, the western extension was decided upon, and these works, completed in 1894, brought the area of the station premises up to no less than eighteen acres, with four extra and very long platforms. This last extension somewhat altered the street geography in the immediate neighbourhood. Cardington Street was diverted and the new works embraced a considerable part of the cemetery attached to St. James' Church. The dead parishioners were reverently re-interred. It will be remembered that a similar transference

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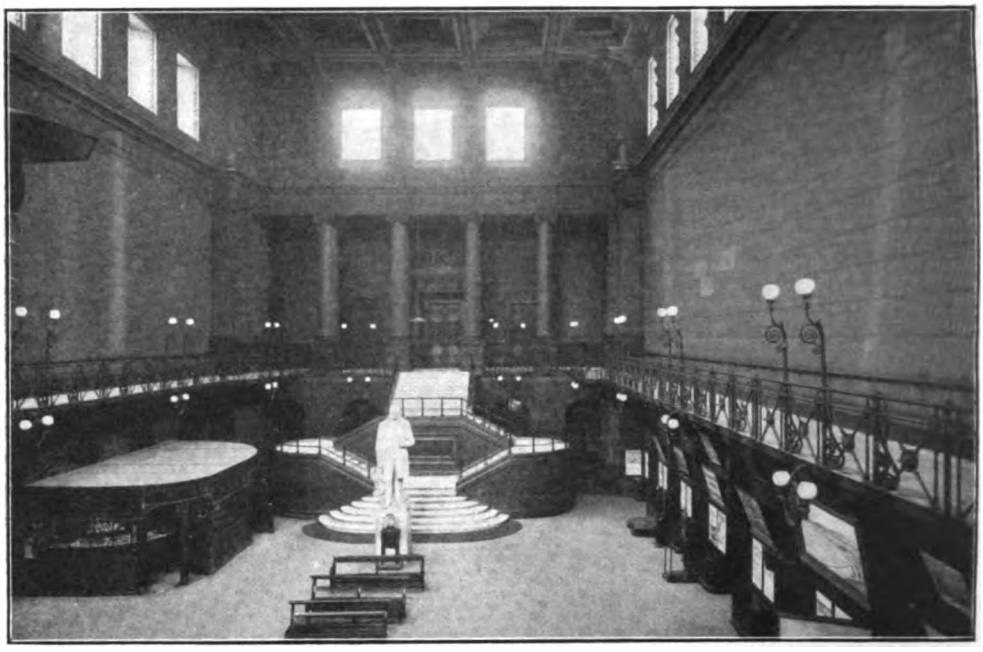

Photo] [*L.N.W.R.*

THE GREAT HALL.

(The centre is at present occupied by a temporary booking office, but this will be removed in due course.)

was carried out from old St. Pancras Churchyard, when the Midland Railway was first extended to London.

There are now 15 platforms at Euston. In view of the large area covered one might expect that there would be more than this, seeing that Liverpool Street has 18 and the new Waterloo 20, but it must not be forgotten that the traffic handled at Euston is essentially different from that dealt with at the other two termini mentioned, both having a very large proportion of suburban trains, while Euston is more particularly a terminus for long distance passengers. In the case of a suburban or short distance service, the trains simply come in and go out again; but main line trains require different treatment. Carriages must be cleaned and inspected before being despatched again to the other end of Great Britain, and they can rarely be used again at once, while it is necessary to select the vehicles or rearrange the make-up for many of the principal services. Nearly all empty main line trains must, therefore, be sent to the carriage sheds and sidings, and returned therefrom only when required.

Consequently, instead of building further platforms, the management set about improving the access to those already in use, with particular reference to the movements of empty trains between the station and the carriage sheds and sidings. In 1901 the scheme known as the "Chalk Farm Widening," was put in hand and completed in 1902. This by means of a "flying junction" carrying the main lines over the empty carriage lines, enables empty stock to be drawn away from the platform it arrived at, and sent to the new carriage sheds situated half way up the incline to Chalk Farm, without fouling the running lines. This scheme, though costly, has proved of incalculable benefit at all times, while at busy periods the strain of getting trains out to time has been greatly lightened. It may be safely said that Euston can now handle a larger volume of long-distance traffic than any other British terminus.

The waiting rooms at Euston have been greatly improved in recent years, to such an extent, in fact, that travellers familiar only with the old conditions receive an agreeable surprise. Bathrooms are provided on No. 6 platform, a feature that is but rarely found at a railway station; only those who have had a long and tiring night journey can appreciate what a real boon a bath is on arriving after a night in the train. Tourists to the north of Scotland will remember the

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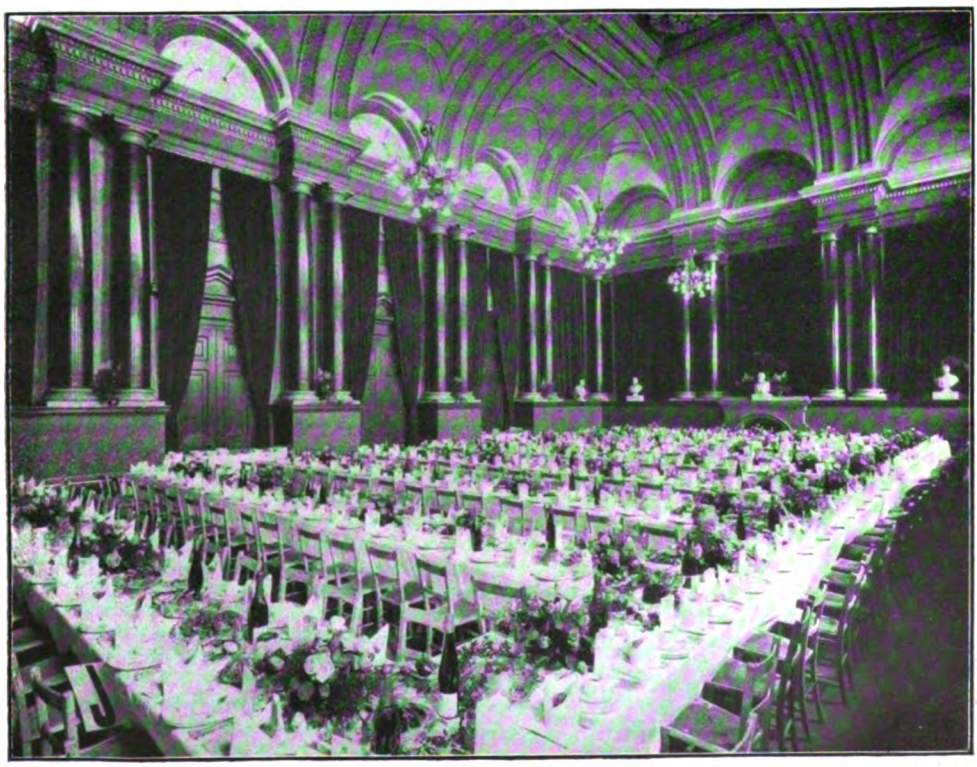
baths at Perth General station, which provision was all right for the down journey; now, thanks to the London and North Western Railway, one is enabled to enjoy a similar facility after the up journey. There is also a fine hair-dressing saloon.

Business men can have their letters typed at Euston, a great convenience for the man who has left his office in a hurry and forgotten something important. The London and North Western was the first railway to instal a "Ladies' Tea Room." The old tea room was an attractive apartment, but the new one, in the modern French style, with its parquet flooring and panelled walls, is a handsome *salon*; large oil paintings of places served by the London and North Western Railway are inserted in the panels and give quite an artistic appearance. There are four other refreshment rooms, all of which have been redecorated of late years. The dining-room also calls for attention. Here first-class meals can be obtained at really moderate charges.

Euston is, however, much more than the London terminus of the London and North Western Railway. It is the headquarters of the leading railway in the United Kingdom, and in addition to the public portions of the station itself, there are hundreds of offices which call for attention. Many of these are reached from the balcony of the main hall, and the accommodation is increased by the new block of offices, at the ends of platforms 12–15, and fronting Drummond Street, built when the station was extended on its western side. Large though this building is, the demand upon its accommodation has already outgrown the supply, and certain departments are at present located in houses in Euston Square, while a few other departments are placed in premises adjacent to the line beyond the station proper. There are at Euston about 1,200 members of the clerical staff. As the offices are somewhat widely scattered and are necessarily very extensive, a complete railway telephone system is installed, having a central exchange and connecting over 100 offices.

To enumerate the offices does not exhaust the catalogue of the territories of Euston. Some of these are out of sight, notably the vast cellars, constituting a veritable catacomb, which extend in all directions



Photo] [*L.N.W.R.*

THE SHAREHOLDERS' MEETING ROOM ARRANGED FOR A SPECIAL FUNCTION.

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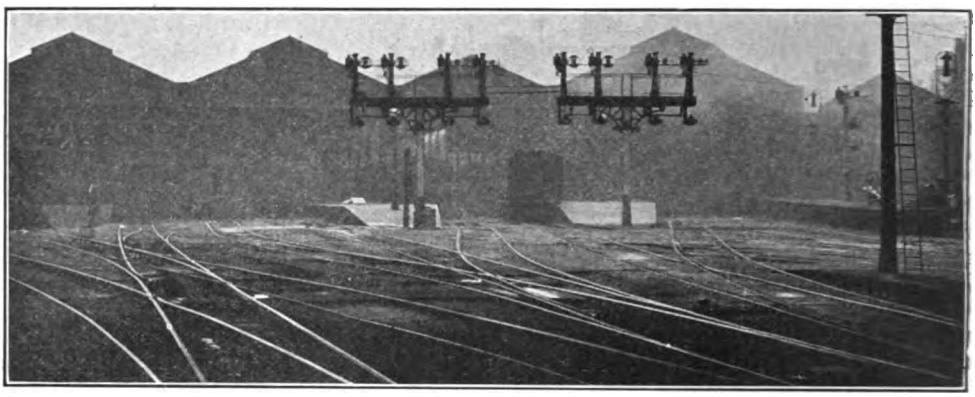

Photo] [*F. E. Mackay.*

THE OUTER ENDS OF PLATFORMS 2—9.

underneath the broad acres of the station premises. On the eastern side of the station are extensive kennels: here, unclaimed dogs which have been travelling or have been found straying on the North Western are fed and housed, a great improvement on the treatment our dumb friends get sometimes. Right at the top of the main office buildings are the Engineer's quarters; these offices are always placed high up, so that a good top light may be obtained for the draughtsmen.

The space in front of the station, between the Grand Hall and the Doric portico, is occupied by a large courtyard, which is now being roofed over, so that intending passengers who drive up may be saved from all inclemencies of the English climate. In the hall itself is at present a large temporary booking office, and a small refreshment room, but these will be removed when their purpose is served, and the great hall will then resume its spacious appearance.

On the western side of the station, passing round the corner from Drummond Street into Cardington Street, noting on the way the imposing block of the new office buildings, we still have company's property all round us. On the left are stables, van yards and a smithy for the horses, while on the right rise two large red-brick edifices. One of these is to the dining cars what a depôt is to an army, for here are the stores of this not altogether unimportant department. In the large kitchens here the food for diners *en route* is prepared; by no means a small factor, in view of the large number of restaurant cars which leave Euston every day. Occasionally there will be as many as five cars on one train, and still a demand arises for more seats. In 1913 no fewer than 1,250,000 meals were served in the cars, a large proportion relating to London traffic.

The second building also deals with the food problem, but in a different way and to a different end. This building, opened by Lord Stalbridge in 1907, is the headquarters of the Euston Library and Literary Society and the premises of the Clerks' Dining Club. Here both mind and body may be nourished at a reasonable figure. The dining room, which is under the actual management of the staff, supplies everything of the very best as regards quality, though the prices charged are extremely low. While this has

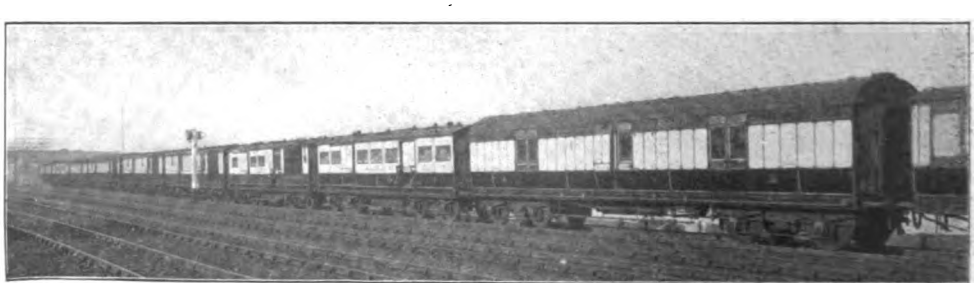

Photo [*L.N.W.R.*

THE POSTAL TRAIN IN THE SIDINGS NEAR WILLESDEN JUNCTION.

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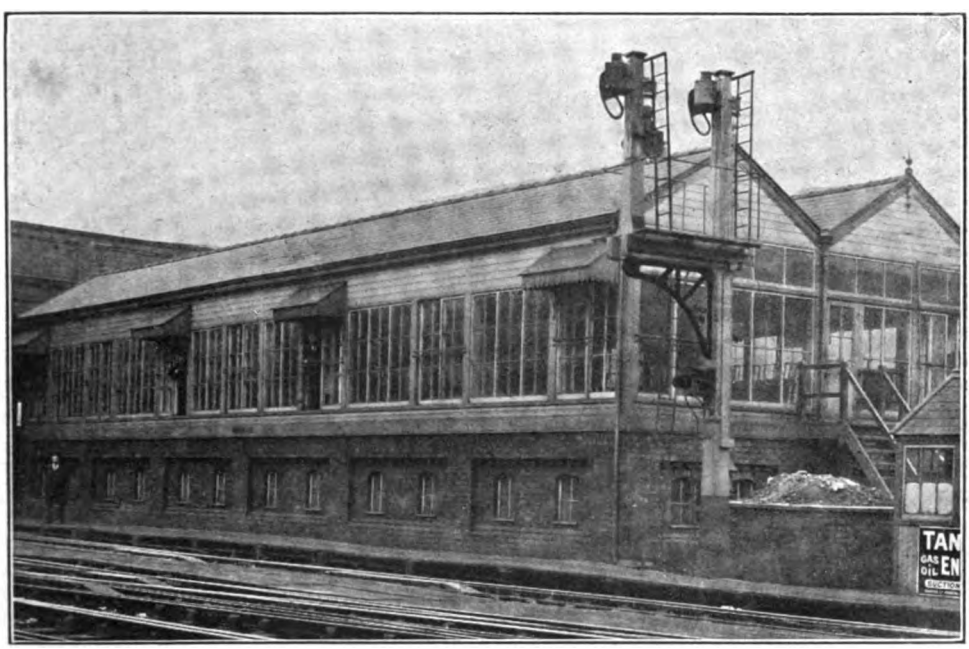
been done satisfactorily, the Club shows a profit on its working and is thus far self-supporting; about 130,000 dinners and 100,000 teas are served per annum. The dining room makes a convenient concert room for the many entertainments that take place after office hours. Upstairs chess, draughts, etc., may be enjoyed, while three excellent tables in the billiard room are in constant demand. The Library contains on its shelves upwards of 16,000 books of all kinds, and, needless to add, is well-patronised. This building replaces older and smaller premises in Drummond Street, which latter are now the headquarters of the Detective Department.

railways and other large commercial bodies. The Company are always ready to help any movement of this kind in any way possible—the Athletic Club's ground and pavilion at Wembley is another instance of their generosity—and in these days of hard commercialism it is pleasant to chronicle this solicitude for the welfare of employés, and no less pleasant to know of the wide appreciation among the staff of the Company's efforts for their comfort.

Having surveyed the various attributes, functions and localities of Euston—it seems more like a small town or state than a mere railway station—let us regard it in its main capacity, that is to say, in its dealings with



Photo] [*F. E. Mackay.*

NO. 2 SIGNAL CABIN.

There is, in addition, the Euston Institute for the uniform staff, which is situated between platforms 7 and 8; this also has a billiard table and supplies refreshments. By the kindness of the Directors, the Shareholders' Meeting Room, referred to before, is used as a ballroom for the monthly dances held under the auspices of the Athletic Club and Literary Society. This hall is also used for concerts, and is in every way admirably suited for both purposes. Indeed, as regards recreative provision for the staff, the London and North Western may be said to hold a leading position among the travelling public. Platforms Nos. 1, 2, and 3 are reserved for the reception of incoming main line trains, all three being served by cab roads alongside. Nos. 4 and 5 deal with incoming and outgoing suburban trains. No. 6, which is of considerable length, wears a more motley character—it deals with all sorts and conditions of trains. This is the platform generally used for outgoing "Royal" trains. At the terminal end there are turntables for horse and carriage trucks. Nos. 7 and 8 are short, and consequently confine themselves mainly to locals. No. 9 does main line business, and years ago,

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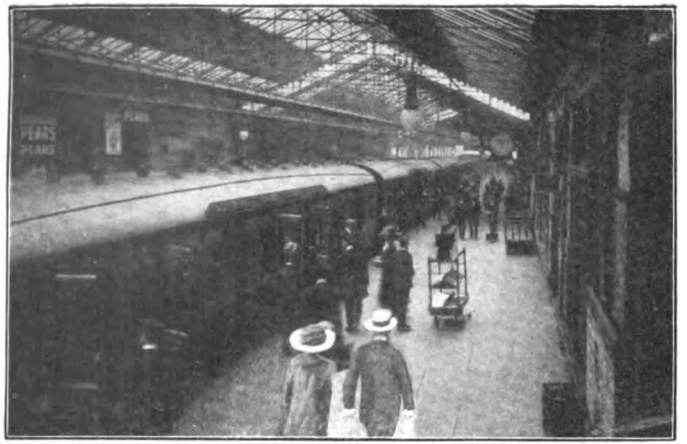

Photo] [*L.N.W.R.*

THE DEPARTURE OF THE 11.10 A.M. RHYL NON-STOP EXPRESS FROM PLATFORM NO. 9.

Photo] [*L.N.W.R.*

PLATFORMS NOS. 12 AND 13.

Photo] [*L.N.W.R.*

LOADING A SPECIAL PARCEL VAN.

Photo] [*L.N.W.R.*

BOOKSTALL ON PLATFORM NO. 13.

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before the station was extended, was one of the most important platforms. Nos. 10 and 11 are more or less closed to the public—the parcels, milk and postal traffic is largely dealt with here. Nos. 12–15 are all of great length, and the heaviest main line expresses are, as a rule, despatched from them, though several important trains start from No. 6. It will be obvious to any traveller that more platforms are required on the departure than on the arrival side in the case of long-distance trains; it is much quicker to unload than to load such trains, as, when they arrive at their destination, there is no attraction to induce passengers to remain in the train, while, in the other case, people in these days like to arrive early to get a good seat, to obtain their tickets, and have their luggage labelled.

Some idea of the magnitude of the long distance express traffic out of Euston and the train service needed to deal with such a traffic may be gained from a glance at the Company's official map of the system. It will be seen that the London and North Western Railway is the shortest or principal route between London and many of the northern and north-western counties and business centres. Briefly speaking, express services are in operation between London and the following towns or districts:—Birmingham, Shrewsbury and Central Wales; North Wales; Ireland (*viâ* Holyhead-Kingstown, Holyhead-Dublin, Holyhead-Greenore, Liverpool-Dublin, Liverpool-Belfast, Fleetwood-Belfast and Stranraer-Larne); Liverpool, Chester and Birkenhead; Manchester and Stockport; the East Lancashire District, Southport and Blackpool; Preston, Lancaster, Morecambe, Carnforth and the English Lake District; and Carlisle, the latter being the Company's gateway, to quote the well-known phrase, "to all parts of Scotland." Some little time ago a folder was issued, entitled, "Euston, the Gateway to the North." After reviewing the traffic which leaves Euston, the justification of this title is at once apparent; indeed, for quite a considerable number of years in the early days of railways, Euston was the only "Gateway" of any kind, Scotch travellers using the route *viâ* Rugby, York and Newcastle.

Perhaps the best way to realise what goes on at Euston in the way of train services is to glance at the time table, and look carefully at both the incoming and outgoing trains during the day's work. The business of the day may be said to begin at 1 a.m. with the departure of the corridor milk train. This is followed at 3 a.m. by the first newspaper express. Neither of these trains is shown in the public time table, as passengers are not conveyed on them. The next event of importance is the departure of the 5 a.m. train. This used to be the newspaper train proper until modern hurry required the papers to go to press much earlier than they had been doing. It is a useful train, serving as it does virtually the whole system, the northern section and Scotland by connection with a Manchester-Glasgow-Edinburgh train. 6.10 is the next departure, a slow train to Bletchley, picking up for the 7.10 a.m. express. This latter train is of much the same character as the 5 o'clock; it also serves everywhere, reaching "Merrie Carlisle," the *Ultima Thule* of North Western metals, at 3.7 p.m. A slow train to Northampton at 7.40 commences the ordinary business of the day. During the summer months there is a "Saturdays only" train to Windermere and Blackpool at 8 a.m.

At 8.30 a.m. the day Irish Mail leaves for Holyhead, connecting there with the City of Dublin Steam Packet Company's 24-knot steamer, which completes the journey to the Emerald Isle. This is the first train of the day equipped with restaurant cars from London, and, like all the important expresses of the London and North Western Railway, it is corridor throughout. Then comes the 8.35, a "semi express" serving Northampton and principal stations to Stafford; and at 8.40 the first of the justly celebrated series of Birmingham expresses, this one stopping only at Willesden and slipping a vehicle at Coventry. This is one of the trains fitted with the vestibuled slip coach described last month. 8.45 gives us another "Saturdays only" train, this being a North Wales Season Excursion. The 9.10 is a slow, while the 9.20 boasts the fastest start-to-stop schedule on the system. This is another Birmingham express, reaching the "hardware capital" at 11.30, and stopping at Willesden and Coventry, between which points it has an average speed of 57·6 miles an hour. A coach for Northampton is "slipped" from this train at Blisworth. About this time, there are often special trains for American passengers embarking at Liverpool; the luxurious twelve-wheeled "special" stock built for this service may be seen on these trains.

In the neighbourhood of ten o'clock Scotland "fills the bill," and we may note a conspicuous difference between summer and

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winter time tables. In winter and the slack season there is one train at 10 a.m. serving Glasgow, Edinburgh, and the further north: in summer there are three trains performing this service, the Edinburgh leaving at 9.55, the Glasgow at 10, and the Perth and Aberdeen at 10.5 a.m. These trains are formed of the new West Coast Joint Stock coaches, and each of them has a luncheon and tea car attached. At 10.10 there is another of the useful series of long distance expresses. This train is not one of the fastest, but it affords a good service to Blackpool, Windermere and Whitehaven; it has, however, one burst of speed between Crewe and Preston, covering the 51 miles in 59 min., an excellent piece of work for a heavy train over a difficult section of line. Liverpool and Manchester are served by the 10.30, a fast and heavy train which also conveys carriages for the East Lancashire towns. The 10.37 which follows, is really a second portion of the 10.30, and goes to Chester and North and Central Wales, slipping a coach for Buxton at Nuneaton. The former of these trains makes its first stop at Crewe, where it divides; the latter calls at Stafford for that purpose. During the summer the 10.37 is replaced by the 11 a.m. Central Wales express, and the 11.10 a.m. for North Wales, the latter making the long run to Rhyl without intermediate stop.

In summer there is another Scotch express at 11.25 a.m., serving, in addition, the Furness line and the Lake District. At 11.50 a two-hour Birmingham luncheon car express leaves; and is followed by two very important trains, the 12.10 Liverpool and Manchester express, first stop Crewe, and the 12.15 Stoke and Manchester express, the latter running *viâ* Northampton and the Potteries. These are two of the most popular trains of the day, and are generally very heavy, particularly the former. At 1.20 Ireland gets another service, *viâ* Holyhead and Kingstown, but here the sea travelling is performed on one of the North Western's own steamers. A Birmingham and North Wales express follows at 1.30, and at 2 p.m. the famous afternoon Scotch corridor train leaves. In 1893 one of the first complete corridor trains in this country was put on this service, and this particular train is even to-day known amongst the staff as "The Corridor." This marked a great advance in comfort at that time, but the Company have not been content to rest on their laurels, and the stock now used for this service ranks as the most luxurious train at ordinary fares in the whole world. By this train one can leave

Photo] [*L.N.W.R.*

EUSTON STATION HOTEL.

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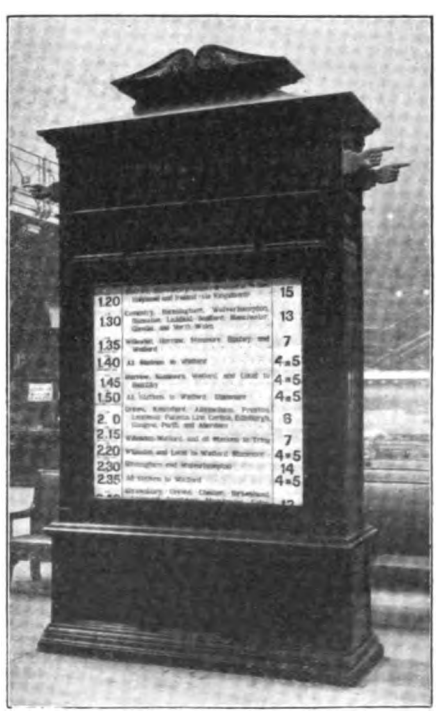
Photo] [*L.N.W.R.*

TRAIN ARRIVAL INDICATOR AT THE END OF PLATFORM NO. 3.

London at a relatively late hour, and yet reach Glasgow and Edinburgh the same evening; besides having through vehicles for Perth and Aberdeen, and connecting with Dundee and the Highland Railway.

At 2.30 another two-hour Birmingham train leaves, with tea car accommodation. The 2.40 is the fast afternoon express to Liverpool and Manchester, first stop Crewe. This also has a tea car. After the departure of the 2.45, a slow train terminating at Stafford, there are no long-distance main line trains due to leave for over an hour, a long period of inactivity in the day's work at Euston.

The 4 p.m. and 4.5 are expresses for Manchester *viâ* Stoke, and for Liverpool respectively. The 4.30 and 4.45 are trains to Birmingham, the second being a two-hour train and reaching its destination before the first. The 5.30 p.m. was formerly a train for Liverpool and Manchester, but, this being a popular hour of departure with the travelling public, it is not surprising that this train grew unwieldy in length and weight. As rearranged, this now serves Buxton, Birkenhead and Fleetwood (for Belfast). Liverpool has its own train at 5.55, with Edge Hill first stop, and Manchester at 6.5, the former reaching its destination in 3 hours 35 min., the latter in 3½ hours. These are two of the most important trains of the day. Indeed, the Liverpool usually goes out with no fewer than five dining cars on, and is a heavy train otherwise. At 6.55 and 7 p.m. are dining car trains to Birmingham, the former being a two-hour train; and at 8 p.m. is the first of the night trains to Scotland. This, in the height of the tourist season, becomes three trains, the first leaving at 7.45 for Inverness, the second at 8 for Aberdeen, and the third at 8.5 for Oban and intermediate stations north of Stirling. Sleeping saloons run on these services, and in the season the trains are literally hotels on wheels. The "postal" departs at 8.30, made up solely of mail vans, 8.45 is the night Irish Mail, and at 8.50 and 9 p.m. are two more Scotch trains. 10 p.m. is the time for the departure of a most important auxiliary train, serving numbers of places and doing a good deal of mail business. This is followed by the 10.15 Irish express to Dublin, North Wall Quay, direct. Again there is a short interval, so far as main line trains are concerned, until 11.45, when the Edinburgh and Aberdeen Sleeping Car express leaves. The fast night train to Glasgow goes out at midnight, and the day concludes with the 12.5



Photo] [*L.N.W.R.*

TRAIN DEPARTURE INDICATOR IN THE GREAT HALL.

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and 12.15 a.m. sleeping car trains to Manchester and Liverpool.

Things are just as busy in the up direction. Business begins at 3.50 a.m. with the arrival of the Scotch "Limited" mail. At 5.50 the up night express from Liverpool and Manchester comes in, closely followed by the night Irish Mail at 6.10. Three trains arrive from Scotland at 6.35, 7.10 and 7.50, and the Irish train on the Dublin, North Wall, service, comes in at 7.30. This batch of early morning trains concludes with the 8.5 a.m. Scotch express. No very important trains are due between this and 10.40, when a two-hour express from Birmingham arrives, followed by a slower train from the same town at 11.10; but between these is the up Fleetwood train, due at 10.50. 12 noon and 12.25 p.m. bring the first Liverpool and Manchester expresses respectively. A Manchester 3½-hour express arrives at 1.15, followed by a two-hour Birmingham at 1.25, followed in turn by the Liverpool express at 1.40. Yet another two-hour train from Birmingham arrives at 2.40. At 3.10 a train comes in from Manchester and Liverpool with through carriages from Birkenhead and Altrincham. 3.20 sees the Central Wales express in, and 4 p.m. the 12 noon *ex*-Manchester *viâ* the Potteries. At 4.20 we may see a train that has left Carlisle at 8.30 a.m. and made a number of calls on the way up. The 4.30 in is a semi-fast from Birmingham, the 4.45 a two-hour express from the same place, while at 5.7, 5.20 and 5.30 come the Lake District, Central Wales and North Wales expresses respectively, followed at 5.40 by the morning Irish Mail.

At 6.10 the afternoon express from Liverpool and Manchester arrives, and the day Scotchman at 6.20. A two-hour Birmingham is due at 7 p.m., and the Perth and Aberdeen day express follows it at 7.10. Birmingham has also two more two-hour trains arriving at 8.20 and 10.10, while the station is kept busy by the arrivals of the 8.10 from Liverpool and Manchester, the 8.30 Scotch and 9.5 Welsh expresses. 9.15, 9.50 and 10 p.m. are the arrival times of dining car trains from Liverpool, Birmingham and Manchester. At 10.45 we may see the 2 p.m. *ex*-Glasgow, and at 11 p.m. the afternoon Irish train is due in. The day may be said to conclude with the arrival of the 11.25 p.m., a useful train whose origin may be traced to Liverpool; from its being frequently made up of all kinds of vehicles it has been nicknamed the "Ugly Duckling."

In addition to these trains there is a frequent suburban service, commencing with an arrival at 3.40 a.m., and concluding with the departure of the 12.25 a.m. to Watford. The backbone of this service is the hourly series of locals to Watford, leaving, as a rule,

Photo] [*L.N.W.R.*

THE PRIVATE TELEPHONE EXCHANGE.

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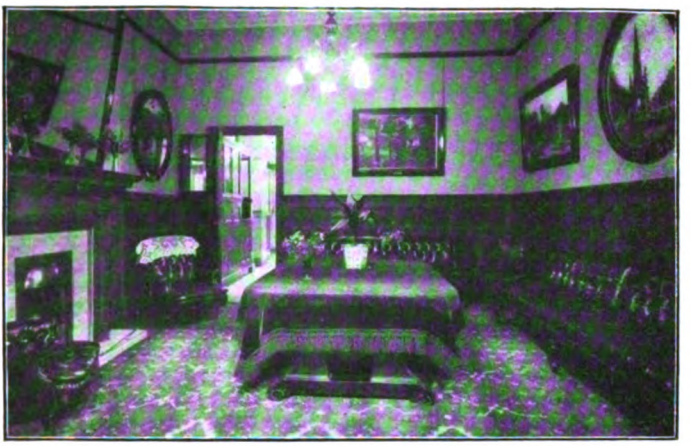

Photo] [*L.N.W.R.*

LADIES' FIRST CLASS WAITING ROOM.

at 40 minutes past each hour : this, of course, is greatly augmented in the business hours, and since the opening of the new suburban lines and stations the service has been increased throughout the day. The trains performing the hourly service are known as the " Watford Locals " ; they are made up of six 8-wheel bogie coaches 50 ft. in length. This stock commenced running in 1897. These were reckoned as very fine vehicles when they first appeared, and it is notable that, though nearly twenty years old, they are still among the best working local suburban services into any London terminus.

Sunday is, of course, much quieter than week-days ; but there is still a fairly heavy service. The night Scotch trains, up and down, remain much the same, while a fairly frequent local service is maintained to accommodate those whose only holiday is on the Sabbath.

Although there is no actual " all night service " like that between Liverpool Street and Walthamstow, it will be seen from the foregoing remarks that Euston does not sleep for long. The period of two hours between the 1 a.m. milk train and the 3 a.m. Newspaper Special is all the night's rest that the great station gets. It is interesting to compare the time table of 1841 with that of the present day, and to note that more goes on nowadays between 12 midnight and 6 a.m. than took place in the whole twentyfour hours in those early days. In the year referred to, 1841, the total number of trains in and out of Euston was twenty-six ; to-day the number of trains entering and leaving is about 315, taking a normal day's work, while on a busy Saturday in the summer months the number will be increased to about 380. Perhaps the best example of what can be done at Euston is to be found on Cup Tie night. The whole neighbourhood resounds with the " burr " of the north-countryman, while the interior of the station itself looks and sounds like pandemonium. But, in spite of the apparent chaos, between forty and fifty long special trains will leave between midnight and 4 a.m., not only departing at their appointed times, but keeping those times all the way down the main line.

Another detail that has improved of late years is the matter of access to Euston. The station is not situated on a great main road, and Euston Square station (formerly called Gower Street) on the Metropolitan, was for a long period the nearest Underground

Photo] [*L.N.W.R.*

THE HAIR DRESSING SALOON.

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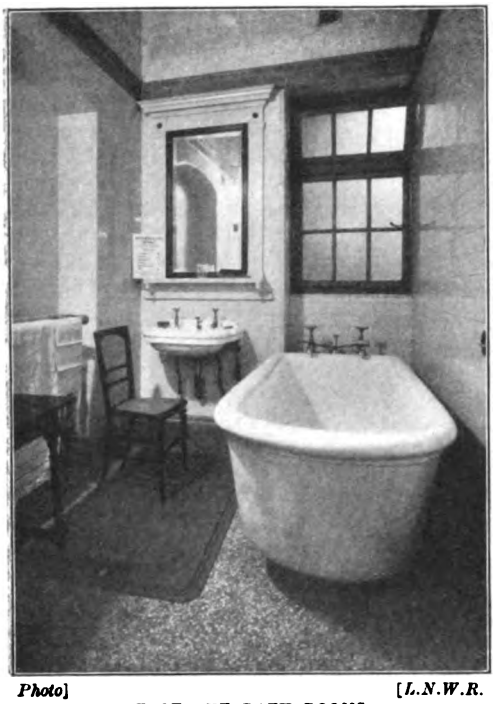


Photo] [*L.N.W.R.*

ONE OF THE BATH ROOMS.

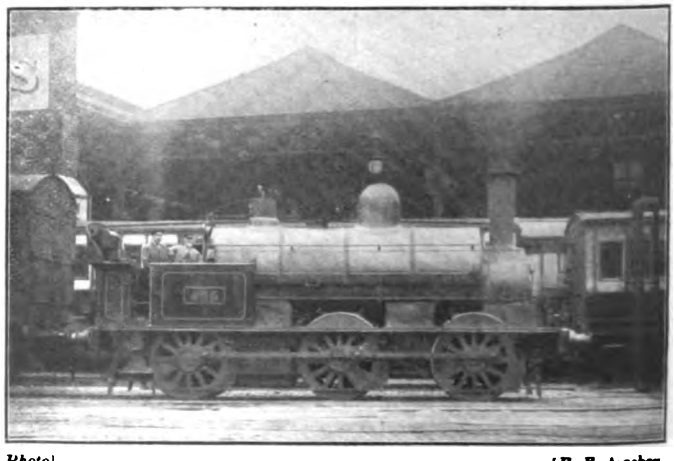
station. With the advent of the Tube railways, however, the City and South London and the Charing Cross, Euston and Hampstead section of the London Electric Railway, the North Western terminus is now one of the most easily accessible of London termini. In addition, a large number of business trains run direct to Broad Street station in the very heart of the City by the "daylight route" over the North London Railway; even Birmingham, 113 miles away, is so served with the "City to City" Express.

As may be imagined, the uniform staff necessary for performing the station work is very large, numbering about 520 men. Many of the general public seem to think that every railwayman in uniform is a porter, and it would probably surprise them to learn that porters form a relatively small proportion of the total staff. There are in addition inspectors, shunters, ticket collectors, dining and sleeping car attendants, carriage cleaners and signalmen. The latter, though they rarely appear in the public eye, are perhaps the most important of all; without them the station would be unable to conduct its business.

It may be mentioned that electric power signalling is employed at Euston; the form used is that known as the Crewe system, from its having been first installed at Crewe. Manipulation is effected by small levers only a few inches long, and arranged in an interlocking frame on principles similar to an ordinary manual frame. These levers make or break appropriate electric contacts, controlling the signal and point motors. No. 2 Box at Euston is one of the largest in the kingdom, having 255 levers. During the busy hours of the day four men are on duty simultaneously.

The present station-master of Euston is Mr. Joseph Jones, who, like many other responsible officials, has worked his way up to the "blue-ribbon" among station-masters on the London and North Western Railway. Starting his career at Rhyl, he has occupied various positions of responsibility. He has been station-master at Whitchurch (Salop), Northampton and Holyhead, leaving the last-mentioned to take up his present office in London, where his marked business ability and genial urbanity have won him many friends.

Euston station and the London and Birmingham Railway were opened in 1838, and the years between then and 1914 have seen many changes in systems of transportation. Even before 1838 the neighbourhood of Euston was connected with railways, for, in 1802, Richard Trevithick, who has been



Photo] [*F. E. Mackay.*

A EUSTON "SHUNTING" ENGINE.

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called "the father of the locomotive," constructed a steam locomotive which gave exhibitions of its powers on a circular piece of track laid near Euston Square. This in itself is a curious coincidence, as is the fact that several of the inventor's descendants have occupied leading positions in London and North Western service.

Nowadays all is different in this once peaceful and forgotten corner of London. Bustling prosperity is now the order of the day, for the takings at Euston are greater than those at any other station in London. As we have mentioned before, the principal business done is in long distance fares, so it will be easy to see how this high standard is attained. Euston also books to more British stations than any other terminus, which gives the intending traveller plenty of choice.

MR. JOSEPH JONES.
Station Superintendent at Euston.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN.

Photo] [*Lieut. B. D. Holberton, R.N.*

LONDON AND SOUTH WESTERN RAILWAY.

West of England Luncheon Car train passing Vauxhall. 4–6–0 locomotive No. 452.

IN continuation of our serial discussions relative to the dimensions and proportions of modern British superheater locomotives, we come now to the consideration of two interesting ratios—in the first place that of total heating surface to grate area, and in the second that of heating surface to cylinder volume. The total area of heating surface in a locomotive boiler, and that of the fire-grate, are two interdependent quantities. It is the amplitude of the fire-grate area, generally speaking, that determines whether the fuel be properly consumed, while the total heating surface of the boiler is responsible for the extraction of the maximum calorific value from the fuel before the waste gases are thrown out of the chimney. It would be impossible, of course, to lay down any definite rule as to what exact proportion these two elements should bear to each other, but, on the other hand, certain general deductions may be drawn from the tables of these ratios given herewith. The average ratio of heating surface to grate area is seen, in the case of 4–6–0 engines, to be 77·9 sq. ft. to 1 sq. ft.—a decrease of 2·2 sq. ft. on the same ratio in the case of non-superheater 4–6–0 engines previously tabulated. The 70·5 sq. ft. per sq. ft. in the case of the 4–4–0 engines also shows a drop of 1·7 sq. ft. as compared with the previous table of non-superheater 4–4–0 engines. An increase of 3 sq. ft. is noticed, however, in the "Atlantic" type engines, the ratio having now risen to 81·7 sq. ft. per sq. ft. The 4–6–0 mixed traffic engines have a still higher figure of 89·5 sq. ft., but the 2–6–0 engines, with their shorter boilers, are seen to average only 68·7 sq. ft. of heating surface to every sq. ft. of grate area, while the tank engines, with shorter boilers still, are yet lower as regards this proportion, the figure for six-coupled tank engines being 66·3 sq. ft., and for four-coupled tank engines 56·1 sq. ft.

Now what do these figures indicate? The locomotive fire-box, with its limitations, is not capable of the same variation in size as the boiler. Longitudinally the development of the fire-grate is governed by the spacing of the coupled axles or the room available behind them, and transversely it is limited by the position of the frames, except in such cases as that of the wide or Wootten type fire-box, which rests above them. As to the boiler, however, although there is a limit in the matter of diameter, which cannot exceed a maximum of about 6 ft. on account of the requirements of the loading gauge, its length is more or less unlimited, varying with the particular wheel arrangement utilised. But to illustrate this we may take the cases of the smallest and the largest engines tabulated herewith—the 2–4–2 type tank engine of the Lancashire and Yorkshire Railway and the famous Great Western 4–6–2 express engine No. 111, *The Great Bear*. The former has a heating surface of 920 sq. ft., and the latter of 3,401 sq. ft., an increase of 270 per cent., whereas the tank engine has a grate area of 18·8 sq. ft. against the 42 sq. ft. (an extreme dimension for this country) of the 4–6–2 locomotive, representing an increase of only 122 per cent. A further illustration is furnished by the 4–6–0 and 4–4–0 types of the Great Central Railway, the former with 2,817 sq. ft. of heating surface and the latter with 1,963 sq. ft., while both enjoy the same fire-grate area of 26 sq. ft. These are extreme cases, no doubt, but they illustrate a principle

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common to all the types under review. The explanation is here afforded, therefore, as to why the ten-wheeled express engines, with their longer boilers, have a larger ratio of heating surface to grate area than the 4–4–0, the 2–6–0 and the tank types.

As to the comparative value of the "extremes" in this table of ratios, two main considerations have to be taken into account —steam-producing ability and economy in fuel consumption. So far as the former is concerned, the design of the fire-box is of vital importance, as it is here, adjacent to the fire, that a very large proportion of the steam is actually raised. The most satisfactory of all types of fire-box appears to be the wide type, which rests on the frames, and which, therefore, can only be employed in the case of locomotives having a trailing carrying axle behind the coupled wheels, such as those of the 4–6–2 and 4–4–2 types. Being more or less square in plan at the fire-grate level, it is far easier to fire than a long narrow fire-grate between the frames, as, for example, that of a large 4–6–0 type engine, even though the area of the fire-grate in each case may be the same. Added to this the steam, as it is generated, escapes more readily from the sloping sides of the inner box to the crown of the outer than is the case with the more perpendicular sides of the Belpaire or the ordinary round-topped fire-box. But, for reasons already stated, the use of the wide fire-box is strictly limited, and it is, moreover, very surprising that this—as one would suppose, the chief—advantage of the "Atlantic" wheel arrangement has only been utilised by two of the seven companies employing engines of the "Atlantic" type.

Assuming the provision of a well-designed fire-box and fire-grate, one or two propositions may be laid down without much fear of contradiction. The short-boilered

FOUR-COUPLED ENGINES.

Type.	Railway.	Typical engine.			Ratios.	
					Heating Surface.	Heating Surface.
		No.	Name or Class.	Superheater Employed.	Grate Area sq. ft. to 1 sq. ft.	Cylinder Vol. sq. ft. to 1 sq. ft.
4–4–2	G.N.R.	1452		Schmidt	77·3	274
	L.B. & S.C.R. ..	421	(Class H2)	,,	81·0	241
	N.E.R.	722	(Class Z1)	,,	86·7	242
				Average	81·7	252
4–4–0	Caledonian R. ..	120		Robinson	77·5	168
	G. & S.W.R. ..	131	(6 ft. class)	Drummond	68·3	209
	G.C.R.	429	*Sir Alexander Henderson*	Robinson	75·5	208
	G.N.R.	51	(Class D1)	Schmidt	64·7	152
	G.N.R. (I.) ..	174	*Carrantuohill*	,,	59·7	160
	G.S. & W.R. ..	341	*Sir William Goulding* ..	,,	74·8	196
	G.W.R. ..	3818	*County of Radnor* ..	Swindon	76·4	177
	,, ...	4101	*Auricula*	,,	76·4	204
	L. & N.W.R. ..	2663	*George the Fifth*	Schmidt	82·6	186
	L. & S.W.R. ..	463		Drummond	63·9	192
	L. & Y.R. ..	1112	(Re-built class)	Schmidt	58·3	116
	Midland R. ..	483	(Re-built class)	,,	70·4	150
	N.B.R.	400	*The Dougal Cratur* ..	,,	78·0	176
	N.S.R.	38		,,	61·0	135
				Average	70·5	174
4–4–4T	N.E.R.	2143	(Class D)	Schmidt	57·9	138
4–4–2T	L.B. & S.C.R. ..	22	(Class I3)	,,	53·4	123
	G.W.R. ..	2221	(6 ft. 8½ in. class) ..	Swindon	59·2	137
	N.S.R.	8		Schmidt	61·0	135
2–4–2T	L. & Y.R. ..	227		,,	48·9	97
				Average	56·1	126

T Tank Locomotives.

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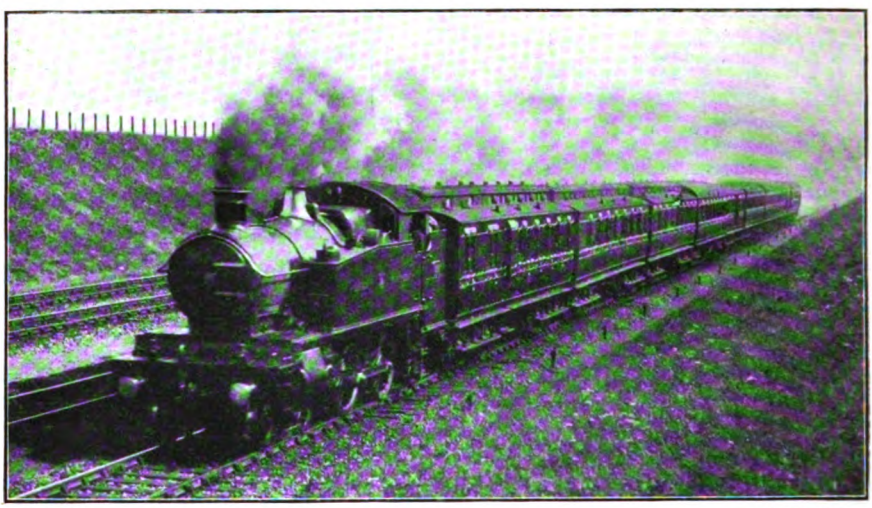
engine is one which may be relied upon to steam well under all conditions, and which will thus, when thrashed, perform exceptional feats of haulage. It will, however, when "pushed" prove a very heavy consumer of coal, owing to the fact that much of the heat derived from the fuel cannot be utilised in the short tubes, and is thus thrown to waste out of the chimney. This I consider to describe fairly accurately the characteristics of the tank locomotive, and to a certain extent those of the 4–4–0 wheel arrangement as well. Readers do not need to be reminded, in view of the many evidences that have appeared in these columns at different times, as to the work that 4–4–0 engines can achieve when necessary—equal in many instances to that of the largest ten-wheeled engines—but the comparative costs in fuel consumption and maintenance at which this work is performed may be disproportionately heavy. Conversely the provision of a long boiler, with ample heating surface, ensures the due calorific value being extracted from the fuel, in whatever quantity it may be burned, and I believe it to be a well-authenticated fact that on certain lines ten-wheeled locomotives are performing the work of the previous standard 4–4–0 engines—very heavy work indeed, it may be explained—on a lower fuel consumption, a result which is probably due partly to this cause, and partly to the more generous provision in the matter of fire-grate area. Generally speaking, therefore, a low proportion of total heating surface to fire-grate area may be held to indicate rapid steaming properties, and a high proportion, coupled, of course, with the provision of a fire-grate of ample area, an economical consumption of fuel.

Referring to the tables, we see that the lowest proportion is that of the tank engines, four-coupled types having an average of 56·1 sq. ft. of heating surface to 1 sq. ft. of grate, and six-coupled types 66·3 sq. ft. to 1 sq. ft. These are, needless to say, the engines of all the types tabulated that possess the shortest boilers, and it will be readily agreed also that in the tank engine, of all types, rapid steaming is a *sine quâ non* for successful working, in view of the frequent stopping and starting of trains usually worked by this class of locomotive. The most remarkable extreme is that reached by the Lancashire and Yorkshire Railway 2–4–2 type superheater tank engines, with a proportion of only 48·9 sq. ft. of heating surface to every sq. ft. of grate; the first-class work of these small engines is well-known, as also that of the Brighton class I3 4–4–2 tanks, with the but slightly higher figure of 53·4 sq. ft. We come next to 2–6–0 mixed traffic engines, also equipped with comparatively short boilers, and on that account having a correspondingly small ratio of heating surface to grate. The Great Northern 2–6–0, in particular, is distinguished by the small ratio of 58 sq. ft. per 1 sq. ft. of grate area, all Great Northern designs being characterised by ample fire-grate area. This is in



Photo] [*R. W. Cole.*

GREAT WESTERN RAILWAY.

Main line train drawn by 4–4–2 tank engine.

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conformity with Mr. H. A. Ivatt's *dictum* that the ability of a locomotive is best measured by its "capacity to boil water," and shortness of steam, so far as one's observations go, is certainly not a common locomotive failing on the Great Northern Railway.

The next stage in boiler progression is reached in the 4–4–0 type, where we find Western Railways, the representative engines of which companies, in each case, are deservedly noted for brilliant work on the road. Of the extraordinary performances of the Lancashire and Yorkshire 4–4–0 superheater type, with the lowest figure in this table, I shall have more to say presently. At the other end of the scale we have the "George

SIX-COUPLED ENGINES.

Type.	Railway.	Typical Engine.			Ratios.	
		No.	Name or Class.	Superheater Employed.	Heating surface. Grate Area sq. ft. to 1 sq. ft	Heating surface. Cylinder Vol. sq. ft. to 1 sq. ft.
4–6–2	G.W.R. ..	111	*The Great Bear*	Swindon	81·0	319
4–6–0	Caledonian R. ..	903	*Cardean*	Schmidt	89·6	228
	G. & S.W.R. ..	129		,,	74·1	177
	G.C.R.	423	*Sir Sam Fay*	Robinson	108·3	257
	G.E.R.	1500		Schmidt	72·4	188
	G.W.R. ..	4041	*Prince of Wales*	Swindon	75·3	192
	,,	2934	*Butleigh Court*	,,	75·3	219
	L. & N.W.R. ..	2222	*Sir Gilbert Claughton* ..	Schmidt	73·2	184
	,,	819	*Prince of Wales*	,,	70·3	191
	L. & S.W.R. ..	447	(6 ft. 7 in class)	Drummond	62·7	185
				Average	77·9	202
4–6–0M	Caledonian R. ..	179	(5 ft. 9 in. class)	Robinson	93·3	219
	G.C.R.	4	*Glenalmond*	,,	108·3	257
	L. & S.W.R. ..	482	(6 ft. class)	*Schmidt	77·3	206
	N.E.R.	782	Class S2	Robinson	79·2	192
				Average	89·5	219
2–6–0M	Caledonian R. ..	37		Schmidt	70·9	162
	G.N.R.	1630	(Class H2)	,,	58·0	150
	G.W.R. ..	4331		Swindon	82·2	181
	L.B. & S.C.R. ..	337		Robinson	63·5	151
				Average	68·7	161
4–6–4T	Mid. (L.T.S.) R.	2100		Schmidt	57·7	158
4–6–2T	G.C.R.	165		Robinson	78·5	174
	L. & N.W.R. ..	2667		Schmidt	61·7	148
	L.B. & S.C.R. ..	326	*Bessborough*	,,	74·6	179
2–6–2T	G.W.R. ..	3121	(5 ft. 8 in. class)	Swindon	59·2	137
				Average	66·3	159

M Mixed Traffic Locomotives.
T Tank Locomotives.
* Certain of these engines are fitted with the Robinson superheater.

still longer boilers, and a still higher average of 70·5 sq. ft. of heating surface per sq. ft. of grate area. The characteristics of the different companies are displayed with equal clearness here, the ratios being low in the case of the engines of the Lancashire and Yorkshire, Great Northern, and London and South the Fifth" class on the London and North Western Railway, the unusual extent of whose heating surface is due to the large number of tubes employed, while, on the other hand, the fire-grate has a comparatively small area. Yet these are by no means extravagant machines on fuel consumption,

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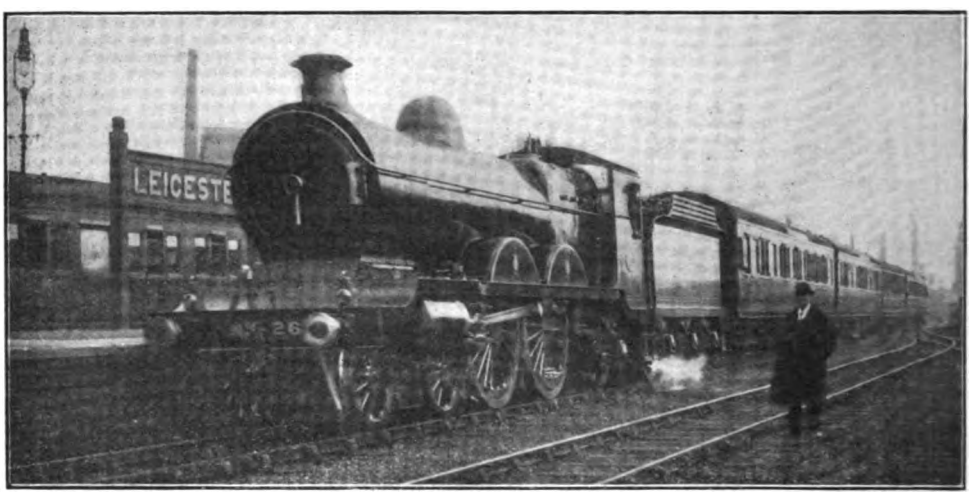
as *vide* the performance of *Wild Duck*, which hauled a load of 410 tons from Willesden to Crewe, at an average speed of over a mile-a-minute throughout, on a coal consumption of 33 lbs. per mile. High proportions of total heating surface to grate area in this class are, in most cases, due mainly to the limited capacity of the fire-box.

We have finally the ten-wheeled engines, and here it is surprising to find the average proportion in the case of 4–6–0 engines less than that enjoyed by 4–4–2 engines, despite the advantages that the latter wheel arrangement enjoys in the matter of fire-box development. Once again we find the London and South Western Railway at the bottom of the list, in company with the two 4–6–0 types of the London and North Western Railway, and the 1500 class of the Great Eastern Railway—the engines in all four cases being also noted for rapid steaming and excellent performance on the road. Both the Caledonian "Cardean" class and the Great Central "Sir Sam Fay" type have small fire-boxes in comparison with boilers of such length and diameter, and the proportions in these cases, particularly the latter, are very high. The same characteristics are apparent in the engines of the 4–6–0 mixed traffic types, the London and South Western locomotive having the lowest proportion of heating surface to fire-grate area, and the Caledonian and Great Central engines the highest. The "Atlantic" engines are all well provided in the matter of both grate area and heating surface, and the type, as a whole, is generally found correspondingly economical in the consumption of fuel. Needless to say, any deductions that one might draw from these figures are purely speculative, but the comparison of these proportions is not without interest. Consideration of the proportion found in the other column—that of total heating surface to cylinder volume—must be deferred until the next issue, in order that we may turn now to performance.

It is some time since I dealt in these columns with the locomotive work of the Lancashire and Yorkshire Railway—not by any means on account of lack of merit or interest in performance on that line, but simply because of lack of sufficient material about which to write. Business in the Manchester district, however, has afforded me the welcome opportunity of securing a series of records with Manchester and Liverpool 40-min. expresses, details of which are tabulated herewith. Were exact time always maintained on these trains, I should be tempted to describe this as the most remarkable train service, from the locomotive point of view, that the country has to offer, as the grading of the road is well-nigh mountainous.

Out of Manchester the actual start is on a sharply rising gradient which extends for $\frac{3}{8}$-mile; then, after $2\frac{1}{4}$ miles of level to just



GREAT CENTRAL RAILWAY.

We are indebted to Mr. A. S. Hawley (at the time fireman of 4–4–2 locomotive, No. 263), for photograph reproduced, showing this engine passing Leicester station with the 3.15 p.m. "Sheffield Special" last summer.

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beyond Pendleton, there follows the Pendlebury bank, 3 miles long, of which 1¼ miles are inclined at 1 in 84, and a further ½ mile at 1 in 92–118. This takes us to a point about ¼-mile beyond Swinton, and a welcome respite now ensues in the shape of 5½ miles of falling grades, broken only by a short ¾-mile rise, mainly at 1 in 100, past Walkden. These grades are mostly fairly flat, the steepest being ⅝-mile at 1 in 150 near Atherton. From Atherton there is a rise of ¾-mile at 1 in 116, followed by 2¾ miles of very slight undulations to near Hindley. There is now a very steep descent commencing at 1 in 93–96 and finishing at which are 2¾ miles at 1 in 235–291–201, to a point midway between Kirkby and Fazakerley. A gentle rise for 2½ miles, and a gentle descent for 3¼ miles into Liverpool complete the journey.

Now the distance between Liverpool and Manchester by the Lancashire and Yorkshire direct route, avoiding Wigan, is one of 36¾ miles, and yet every non-stop express (saving only one), without distinction of load, is allowed 40 min. for the journey in either direction. With a load of 3 or 4 eight-wheeled vehicles, which represents the composition of the majority of the expresses, the booking is feasible enough, although

LANCASHIRE AND YORKSHIRE RAILWAY—MANCHESTER TO LIVERPOOL.

Distance (miles).	Run No. ..	1	2	3	4	5	6	7	8	9	10	11
	Engine Type ..	4–4–2					4–6–0					4–4–0 S'heater
	Engine No. ..	735	1423	1394	1407	702	1517	—	1506	1509	—	1098
	Load (axles) ..	12	12	22	26	34	26	26	29	30	30	16
	,, (tons) ..	80	80	160	200	250	200	200	210	225	225	120
—	Manchester dep.	0.00	0.00	0.00	0.00 c	0.00	0.00	0.00	0.00	0.00 e	0.00	0.00 c
2¼	Pendleton pass	4.05	3.45	4.05	5.30	5.10	4.00	4.15	4.55	5.40	4.50	4.50 f
5	Swinton ,,	7.25	7.05	7.30	9.30	9.10	7.25	8.10	8.50	10.10	9.15	8.55
10¾	Atherton ,,	13.20	13.10	13.25	15.25	15.45	13.20	14.25	15.05	16.55	15.30	14.35
15	Hindley ,,	17.25	17.25	17.10	19.25	20.15	17.45	18.50	19.10	21.25	20.10	18.00
19¼	Pemberton ,,	21.35	21.25	21.10	23.05	24.05	22.00	23.05	23.10	25.20	24.25	21.50
21	Orrell ,,	23.50	23.20	23.20	25.00	26.20	24.30	25.25	25.30	27.45	27.05	24.00
24½	Rainford ,,	27.20 a	27.00	27.15	28.35	30.35	28.40	29.35	29.30	31.40	31.10	27.20
29¾	Kirkby ,,	33.15 b	31.25	32.05	32.40	34.50	33.25	34.35	33.40	35.45 b	35.35	31.15
35¼	Sandhills ,,	39.00	36.30	36.55	37.25	39.50	38.35	40.05	38.30 d	42.40 d	40.30	35.30
36¾	Liverpool arr.	41.40	39.15	39.35	39.55	42.25	40.55	42.35	42.00	45.50	43.20	38.15
36¾	Net times (min.)	39½	39¼	39½	38½	42¼	41	42½	41	42	43¼	36

a—p.w. check, Rainford Jc. b—signal check, Fazakerley. c—p.w. check, Salford.
d—signal check outside Exchange sta. e—signal check, Pendleton. f—p.w. check, Swinton.

1 in 150, which brings us to the point where the London and North Western main line is crossed, but very high speeds are not usually run here, owing to the presence of colliery workings beneath the line. After a short strip of level, a steep "pull" upwards commences, at 1 in 150–173 as far as Pemberton, 1¼ miles, and at 1 in 91 for the 2¼ miles thence to Orrell tunnel, ¼-mile beyond Orrell station. The summit is a level stretch, ⅜-mile long. All running difficulties in this direction are now at an end; from the tunnel to Rainford Junction there is a fall of 2¼ miles at 1 in 111–116, with 6⅜ miles further at easier grades, the steepest of even then there is barely any margin of time in hand for meeting signal or permanent checks when such arise *en route*. With heavier trains, however, as the tables of runs fully demonstrate, the 40-min. schedule becomes a "counsel of perfection," and one must be forgiven for saying, as a matter of purely personal opinion, that such a timing for an important business service, on which exact time-keeping is essential, is not altogether practical. I am inclined to consider the east-bound route the harder of the two. After the fairly level start from Liverpool to Kirkby comes the long "pull" for 8½ miles to Orrell tunnel, but the descent of

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the ensuing bank is altogether spoiled by the substantial reduction of speed which must be made for the facing junction at Pemberton. Thus the ascent of the steep Hindley bank, despite any recovery of speed beyond Pemberton, is not entered upon at the high rate which should obtain at this point. Beyond Hindley the tendency of the undulations is not in favour of the east-bound journey, while the descent from Swinton can only be taken at a moderate speed in view of having the train well in check for the congested final length into Manchester. Going west, however, the only difficulties are the Pendlebury and the Pemberton banks, while all the down grades save that past Hindley may be taken at top speed, including the glorious "racing" stretch from Orrell tunnel right into Liverpool.

Photo] [*R. J. Osborne.*

LONDON AND NORTH WESTERN RAILWAY.

2.5 p.m. Birmingham-London express.
4–4–0 locomotive (Schmidt superheater) No. 1218 *Australia.*

In the first table will be found eleven east-bound runs, of which all but one were made behind engines of the 4–4–2 or 4–6–0 types. The comparison, strange to relate, very distinctly favours the former type; with a road of such a character this is the more paradoxical seeing that the "Atlantics" have 7 ft. 3 in. driving wheels against the 6 ft. 3 in. of the six-coupled engines. The only possible reason that might suggest itself is that the boilers of the 4–6–0 locomotives, large as they are, are unable at high speeds to supply sufficient steam to four cylinders 16 in. diameter by 26 in. stroke, more especially as the fire-grate area is small in comparison with the heating surface, the proportion being as high as 92·9 sq. ft. per sq. ft. I am free to confess that 6 of the runs, No. 4 and Nos. 6 to 10 inclusive, were made on one of the heaviest trains that I could have timed—the 4.30 p.m. express from Manchester to Liverpool—which is composed of the latest North Eastern Railway vestibuled stock with restaurant car. With this train it will be seen that only the "Atlantic" in column 6 was able to keep time; the 4–6–0 engines lost a little time on every run. I should be the last to say that any of these runs, even when time was lost, could be classed as bad; load and road considered, they were undoubtedly good, but at the same time they prove my point as to the unwisdom of maintaining this uniform 40-min. time irrespective of average load hauled. Runs 1, 2, 3 and 11 were made on various ordinary trains during the day, and in each case, allowing for delays, time was kept without difficulty. On run No. 5 we had a very heavy load with the 2.30 p.m. vestibuled Lancashire and Yorkshire luncheon car express *ex*-Manchester, and here again time-keeping was quite beyond the engine's powers.

The runs may now be dealt with in a little more detail. Runs 1 and 2 are average specimens of "Atlantic" performance with 3-coach trains. On the first a maximum of 68·1 miles per hour was reached at Atherton, and on the second one of 66·1 miles per hour; the minimum rate at Orrell tunnel

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in each instance was one of 42·9 miles per hour, while beyond Rainford slack the first train recovered to 70·3 miles per hour, while the second, with no slack, touched a top speed of 72·5. The finest feature of the second run was the very smart start to Swinton, a speed of 48 miles per hour being maintained up the 1 in 84. Run No. 3 was made on the 2.30 p.m. express with a fair load, but still one very much lighter than that shown in column 5. The start was smart, and the high maximum of 75 miles per hour was then touched at Atherton, bringing this run ahead of all competitors at Hindley. Beyond Rainford, with time reached here. At Orrell tunnel speed only fell to 45 miles per hour—a remarkably fine figure this—and we then made a lightning descent into Liverpool, covering the 10¾ miles from Rainford to Sandhills in 8 min. 50 sec., and touching a top speed of 81·8 miles per hour. In Run 5, as previously mentioned, the load beat the engine, although one would have hardly expected an increase of 50 tons in the load to increase the net time of the preceding run by as much as 4 min. The minima on the Pendlebury and Orrell banks were 41·3 and 37·5 miles per hour respectively, while the maxima at Atherton, Hindley, and beyond

LANCASHIRE AND YORKSHIRE RAILWAY—LIVERPOOL TO MANCHESTER.

Distance (miles).	Run No.	12	13	14	15	16	17
	Engine Type	4–4–2				4–4–0 Non-S'heater	4–4–0 Superheater
	Engine No.	1407	1409	1398	1393	429	1098
	Load (axles)	16	18	18	18	24	16
	,, (tons)	110	130	130	130	160	110
—	Liverpool	0.00	0.00	0.00	0.00	0.00	0.00
1½	Sandhills	3.00	2.40	2.50	2.55	3.05	2.55
7	Kirkby	8.25	8.10 b	8.45	8.45	9.10	8.00
12¼	Rainford	13.10 a	13.50	14.25	14.00	14.55	12.15 a
15¾	Orrell	16.50	18.10	18.45	18.20	19.35	16.00
17½	Pemberton	18.45	19.40 c	20.20	19.55	21.35	17.50
21¾	Hindley	23.15	24.40	24.50	24.10	26.05	22.25
26	Atherton	27.30	29.05	29.20	28.45	31.20	26.35
31¾	Swinton	33†25 / 33.35	34.30	34.50	34.45	37.20	32.00
36	Salford	f	38.40	39.10	39.20 d	41.50	37.45 e
36¾	Manchester	43.10	40.25	40.45	41.30	43.35	39.35
36¾	Net times (min.)	38¾	39	40¾	40¾	43½	37

a—p.w. check, Upholland. b—p.w. check, Rainford Jc. c—p.w. check, Hindley.
d—signal check outside Victoria sta. e—p.w. check, Swinton (severe).
f—series of signal checks, Swinton to Manchester. †—dead stand for signals.

well in hand, no higher speed than 72·5 miles per hour was touched, and we finished comfortably with half-a-minute in hand. Run No. 4 is quite my most brilliant "Atlantic" run, and, indeed, is one of the two finest in the whole series. With a heavy load we were unfortunately checked at the start, and the ascent of Pendlebury bank was thereby hampered, but once over Swinton summit the performance was exceedingly fine. Approaching Atherton we were doing 70·3 miles per hour, and beyond Hindley the speed was well above the average, a further maximum of 72·5 being Rainford were 66·1, 72·5 and 76·3 miles per hour.

Of the 4–6–0 runs the best was undoubtedly No. 6, and the hill-climbing at the start in this case was really good, an average speed of 45 miles per hour being maintained up the 1 in 84 of Pendlebury bank with 200 tons behind the tender. At Atherton we were doing 70·3 miles per hour, and as far as Hindley there was good prospect of keeping time, but thereafter the work fell off sadly. Most of the descent of Hindley bank was taken without steam, and the speed on the succeeding ascent to Orrell fell

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to as low a figure as 24·3 miles per hour, while the descent past Rainford was also taken with extraordinary caution, steam being shut off for a long distance. Consequently we did not exceed a maximum of 70·3 miles per hour on this tempting length, and lost 55 secs. on the run. No. 7 run was comparatively poor, time being lost all the way. On No. 8 trip, had the hill-climbing at the start been anything to compare with that of run 6, we should have achieved a net time of well under 40 min., thus showing that the 4–6–0 engines can keep the schedule time with 200 tons, if really put to it. But our average speed up the 1 in 84 was barely 40 miles per hour, while at Orrell tunnel also the rate fell to 37·5, so that maxima of about as feeble as in the preceding run, and low downhill speeds in this instance resulted in a total loss of 3 min. 20 sec.

By far the best run is that detailed in column 11, behind the small 4–4–0 rebuilt with Schmidt superheater, which turned out to be a veritable fire-eater in the matter of performance. We were badly checked at the start, but actually *accelerated* on the 1 in 84 to 48·9 miles per hour. Approaching Swinton a very severe permanent way check indeed befell us, but we recovered from this with lightning rapidity, and were doing 66·1 miles per hour before passing Walkden. At Atherton, and again on the undulating stretch past Daisy Hill, we ran freely at 75 miles per hour, and the times from Swinton

Photo] [*H. E. Ambrose.*

GREAT WESTERN RAILWAY.

Birmingham-London Express. 4–6–0 Engine, No. 4030, *King Harold.*

71·4 miles per hour at Atherton and 77·5 at Rainford failed to bring the net time within less than 1 min. of the 40-min. booking. The speed capabilities of the Lancashire and Yorkshire 4–6–0 engines were best displayed, however, in run 9, but in this instance the hill-climbing was really poor, particularly on the short ascents past Walkden and Atherton. In a measure the Salford check was responsible for the low speed of 35·5 miles per hour on the 1 in 84; at Orrell tunnel the minimum was 37·5, as in the last run. Beyond Rainford, however, some very fast running was made, the highest speed touched being 80·3 miles per hour. The hill-climbing in run 11 was to Hindley, despite the recovery from the check, will be noticed to beat those of the nearest competitor by 35 sec. From Hindley to Pemberton we ran cautiously, and slacked carefully—an unusual proceeding in this direction of running—for the junction. On the 1 in 91 to Orrell tunnel we accelerated to 45·9 miles per hour, and then followed a tremendous burst of speed, a maximum of 84·9 miles per hour being reached, and a rate of well over 80 maintained for many miles. It will be noticed that the 10¾ miles from Rainford to Sandhills were covered in 8 min. 10 sec., at an *average* speed of 79 miles per hour! It is difficult to estimate a net time for this trip; had we had a clear

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road, and taken the falling grades beyond Hindley and the junction at Pemberton at a more customary speed, we might easily have completed the journey in 35 min. The load was one of 4 vestibuled eight-wheelers.

In the reverse direction, strangely enough, I have not had a run behind a 4–6–0 engine, my experiences being mainly with "Atlantics," with moderate loads. Even with such a load as 3 vestibuled eight-wheelers and a twelve-wheeled dining car, as in runs 13 to 15 inclusive, time-keeping is none too easy a matter, as the table shows. Of the "Atlantic" runs the first (No. 12) was quite good, a speed of 70·3 miles per hour being attained on the very slight descent to Kirkby troughs, and Rainford being passed within 55 sec. of "even time." We had a slight permanent way check beyond Upholland; our speed on the 1 in 111 immediately prior to this was 52·3 miles per hour. At Atherton a maximum of 71·4 miles per hour was touched, and at Walkden 69·2, but now, with every prospect of a good finish, we were stopped dead by signals at Swinton, and checked all the way into Manchester. The start on No. 13 run was one of the most brilliant things I have ever timed in its earliest stage, Sandhills, 1½ miles, being passed in 2 min. 40 sec.; at Kirkby troughs we were doing 66·2 miles per hour, and speed was well maintained until we were checked near Rainford for relaying. Beyond Pemberton, also, we were slacked for the same cause. At Atherton we touched 71·4 miles per hour, and we then ran without further incident into Manchester, the checks having only occasioned a loss of 25 sec. Runs 14 and 15 call for no special notice; the starts, though —as always—good, did not come up to those of runs 12 and 13. Net time should have been kept on No. 15, but the work fell off badly on the rise to Swinton, causing a loss of quite ¾-min.

Runs 16 and 17 are of interest in that they compare the work of one of the standard 4–4–0 engines before and after rebuilding with superheater. I say "compare," but it would be more correct, I think, to say that there is no comparison! In Run 16 No. 429 was obviously overloaded with 6 eight-wheelers, and lost 3½ min., although the work was undeniably good at that. As far as Rainford, indeed, it was quite smart for an early type of engine, but at the tunnel the rate had fallen to 40 miles per hour, and time was lost steadily throughout. Now we come again to the work of our friend, No. 1098, and I consider this is a run that truly deserves the much-abused epithet "phenomenal." At Kirkby troughs, with the assistance merely of 2½ miles at grades well over 1 in 300 in steepness, we were travelling at 75 miles per hour; up 3 miles at 1 in 201–291–235 the rate was maintained steadily at 73·8, and at Upholland, after 2 miles at 1 in 111, we were still doing 61·7 miles per hour! Alas for permanent way repairs—they do spoil all the finest records! But for the slack at Upholland we should certainly have entered the tunnel at the mile-a-minute rate, well under "even time" from the start, despite the unbroken rise of 8½ miles from Kirkby troughs. The slack was severe, as also that at Pemberton Junction, and the ascent of Hindley bank was thereby hampered, although it was probably because we were so well before time that the driver let the speed fall to 50·5 miles per hour at the summit, and gave us no further exceptional feats of speed. Still, we touched 71·4 miles per hour at Atherton, and 70·3 at Walkden, running finally into Manchester, despite a further severe check at Swinton, 25 sec. in advance of schedule time. Once again it is difficult to estimate a net time, while as for a *possible* time, there is no knowing what a continuance of the initial effort might have produced! We have frequent demonstrations in performance of the value of superheating, but it is seldom that they are of so remarkable a character as those afforded by the runs just described.

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ELY STATION.

From the *Illustrated London News*, Saturday 30th October 1847.

The Northern and Eastern Railway and its Connections. [No. II.]

By H. H. MEIK.

SIGNALLING on the line was originally extremely primitive. Mr. G. P. Neele, late superintendent of the line L. & N.W.R., states in his "Railway Reminiscences" that it was "as simple as could well be devised. A lofty pole at the end of the station platform was furnished with a circular creel or basket painted red. If this were pulled to the top of the pole the train was to stop. Semaphores and distant signals were unknown on the line, but, while this was the case with signals, the telegraphing of train progress was in advance of any system in vogue at the time on any other line."

During the year 1844 the Yarmouth and Norwich and Norwich and Brandon Companies entered into negotiations with the result that both companies applied to Parliament for an amalgamation Act which they obtained on 30th June, 1845 (8 and 9 Vict. Cap. 41) under the title of "The Norfolk Railway," exactly one calender month before the Norwich and Brandon line was opened.

In the session of 1847 the Norfolk Company procured an act for extending their line at the Yarmouth end from Vauxhall Station to the Yarmouth fishmarket, a distance of one mile 62 chains, and subsequently they obtained another act authorising a continuation of the Dereham branch of the old Norwich and Brandon Railway to Fakenham, a distance of 12⅛ miles, opened on 20th March, 1849. A connection had already been made at Dereham in 1848 with with the East Anglian Railway. A separate company called "The Wells and Fakenham Railway" continued the line to the former place in 1857.

In the same year (1847) powers were obtained for the construction of extensions to Blakeney and Wells, from Reedham to Diss, and from Wymondham to Diss all of which were abandoned. With regard to the last mentioned line it may be remarked that the Great Eastern Railway constructed a line from Wymondham to Forncett, and this was opened in May 1881. The Lowestoft Railway and Harbour Company, incorporated in 1845 (8 and 9 Vict. Cap. 45), branches off from the Norwich and Yarmouth line 15 chains east of Reedham Junction station and crossing the Yare runs to Haddiscoe, 3½ miles, where it joins the Halesworth, Beccles and Haddiscoe Railway built in 1854, (afterwards called the East Suffolk Railway). Then it passed under the Beccles and Yarmouth (South Town) section of the latter railway. Just before reaching Somerleyton Station the river Waveney is crossed, and the line then continues along Oulton Broad, terminating at Lowestoft Central Station, 11⅜ miles distant from Reedham.

In 1846, (9 and 10 Vict. Cap. 132) this line was leased to the Norfolk Railway in

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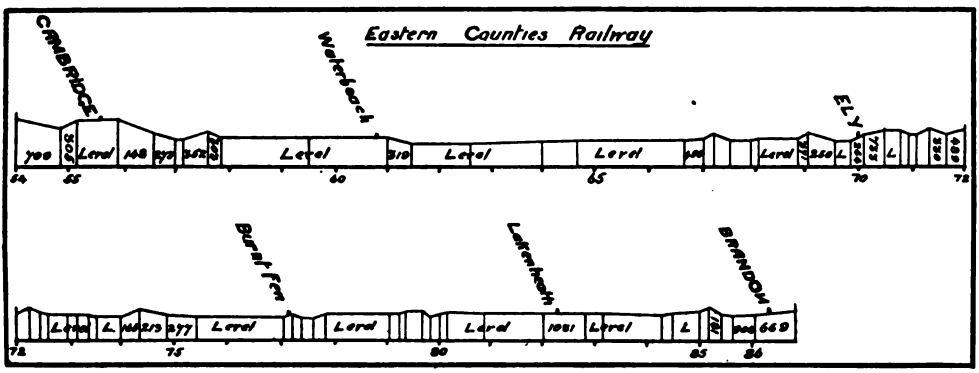
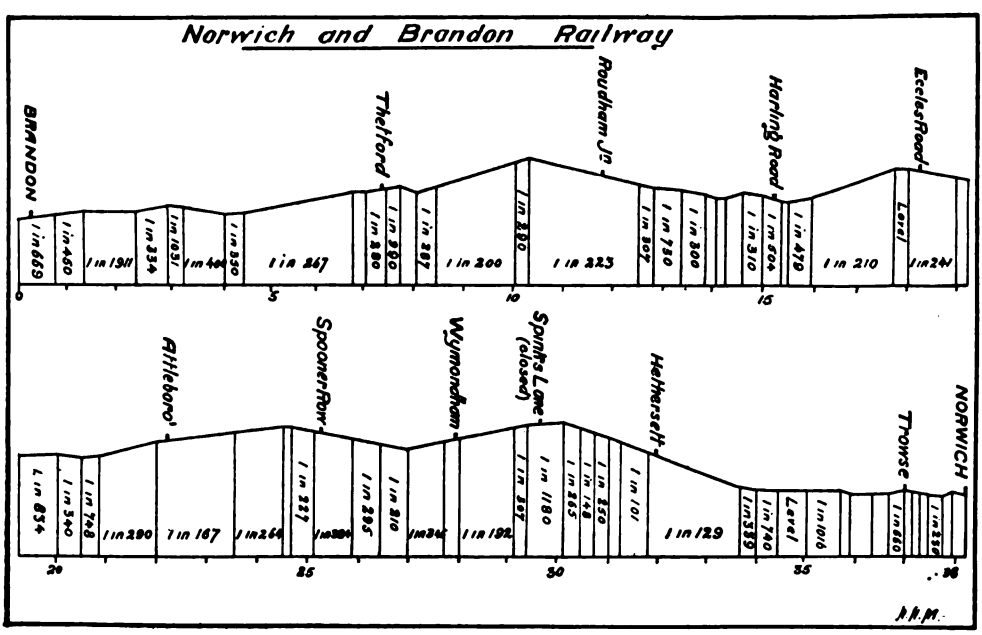


GRADIENT PROFILE: CAMBRIDGE TO BRANDON, EASTERN COUNTIES RAILWAY.

perpetuity, from the completion of the railway, harbour, and navigation, with an undertaking to pay the Lowestoft Company four per cent and half surplus profits on their capital of £120,000, or so much thereof as should be expended for that purpose. This line was opened as a single line for goods traffic on Monday, 3rd May, 1847, when one train passed through to Lowestoft in the morning and another returned in the evening. A goods service was maintained over the line, until it was opened for passenger traffic on Thursday, 1st July, in the same year; the line "having been previously inspected and reported upon in a favorable manner by Captain Coddington, the Government inspector."

At the time of opening the line, it was evidently intended that Lowestoft should become a port for cross channel communication, as one of the principle papers of the period stated that "Packets of first rate construction now finishing in London will be ready in August and with them it is intended to keep up a constant communication between Rotterdam, Hamburgh and other Continental ports and Lowestoft. These packets, and vessels from allparts of the north of Europe, will deliver their cargoes at Lowestoft where they will be readily placed on the railway and readily conveyed to all parts of England by means of the Norfolk, the Ely and Peterborough, and other lines. From the north of England to the north of



GRADIENT PROFILE: BRANDON TO NORWICH, NORWICH AND BRANDON RAILWAY.

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EASTERN COUNTIES & NORFOLK RAILWAYS

TIME TABLE.

LONDON, CAMBRIDGE, AND NORWICH.

☞ Passengers are recommended to be at the Stations five minutes earlier than the time specified in the Table, which is the approximate time only.

SEPTEMBER 15th, 1845.

DOWN TRAINS—(Sundays excepted.)

Miles.	LONDON to NORWICH.	A.M.	A.M.	A.M.	A.M.	A.M.	Noon.	P.M.	Third Class. P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	Mail. P.M.
	London														
26	Romford														
34	Lea Bridge														
71	Tottenham														
9	Marsh Lane														
96	Edmonton														
111	Ponder's End														
144	Waltham														
19	Broxbourne														
22	St. Margaret's														
30½	Ware														
38	Hertford														
22	Roydon														
44¼	Burnt Mill														
36½	Harlow														
29½	Sawbridgeworth														
22½	Bishop's Stortford														
25½	Stanstead														
37	Elsenham														
41½	Newport														
43½	Wendon														
47½	Chesterford														
50½	Whittlesford														
54	Shelford														
57½	CAMBRIDGE { arrival / departure														
62½	Waterbeach														
67½	CAMBRIDGE { arrival / departure														
73	Ely														
79	Mildenhall														
84½	Lakenheath														
88½	Brandon														
95½	Thetford														
104½	Harling														
106½	Roudon														
110	Attleborough														
115	Spooner Row														
118½	Wymondham														
117	Spink's Lane														
119½	Hethersett														
126	Norwich														

SUNDAY TRAINS.

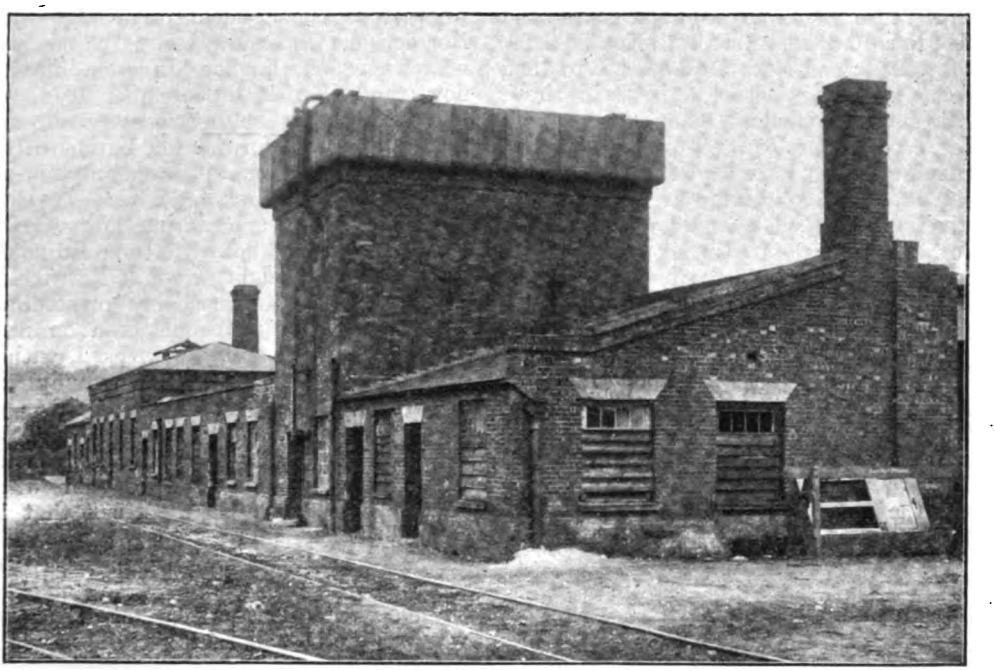
A.M.	A.M.	P.M.	P.M.	Mail. P.M.

Europe goods will be sent by the same means of transit."

The Norfolk Railway existed as a separate company, until 8th May, 1848, when, by an agreement, dated 2nd of that month, entered into with the Eastern Counties Railway, "all the lines of the Norfolk Railway which should be then open for traffic should be given up to the Eastern Counties Railway which latter company should have the perfect control over them and that until the contemplated amalgamation should be sanctioned by Parliament, the lines should be under the management of a joint committee to be composed of four members of the Eastern Counties Board and three members of the Norfolk Railway."

In 1849 an attempt was made to amalgamate the Norfolk and Eastern Counties Railways. The committee of investigation of the latter company recommended the amalgamation, expressing the opinion that if the opposition to the amalgamation should succeed, "irreparable injury will be done to the Eastern Counties Company without any countervailing benefit to the Norfolk Company." A bill was presented to Parliament, for the amalgamation, but was thrown out by the House of Lords in July 1849, although it had been agreed to by the shareholders of the Eastern Counties Company, by a majority of 21,000 against 2,470.

In 1852 some friction arose between the Norfolk Railway and the Eastern Counties Company as to the running of trains, which had been worked by the latter company since May 1848. The Norfolk Company asserted that the line was not being worked in the manner it ought to be worked, and that the main line trains were so unpunctual that the branch traffic became so irregular as to be of little use for local purposes. This little disagreement was however, settled afterwards to the satisfaction of both parties. On 7th August, 1862, (25 and 26 Vict. 223) the Eastern Counties, Norfolk, East Anglia Newmarket, and Eastern Union Railways, were amalgamated under the title of "The Great Eastern Railway."



BRANDON LOCOMOTIVE SHOPS.

The chief locomotive line depot of the Norfolk Railway was at Norwich, where the companies repairing shops were situated. They are still used by the Great Eastern Railway, as the district repairing shops. There was another depot at Brandon, but this was done away with when the Eastern Counties Company took over the working of the line, though the buildings still exist. The locomotive stock taken over by the Eastern Counties, under the agreement

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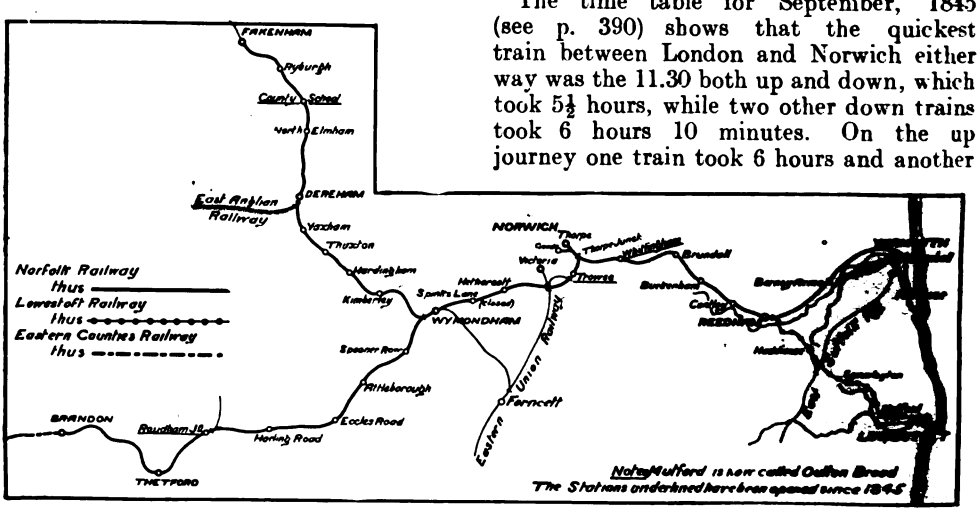
of 1848, consisted of 37 locomotives, but Parliamentary authority not having been procured for their incorporation with the Eastern Counties locomotives, they had to be kept separate until July 1850, when the working agreement was sanctioned. The locomotive superintendent of the Norfolk Railway while it was an independent company was Mr. W. P. Marshall whose headquarters were at Norwich. The locomotives were renumbered as part of the Eastern Counties stock as follows; viz. Nos. 1 and 2 sold before transference, and Nos. 3, 5 and 24 sold after being taken over without being renumbered. Nos. 4, 6, 7 and 8, renumbered 45 to 48; Nos. 9, 10 and 11, 140 to 142; No. 12, 204; No. 13, 42; Nos. 14 and 15, 143 and 144; Nos. 16 to 23, 220 to 227; Nos. 25 to 29, 228 to 232; and Nos. 30 to 39, 130 to 139; No. 4 was a six wheel 5 ft. 6 in. single with outside cylinders 14 in. by 24 in.; Nos. 6 to 12 were 6 wheel 6 ft. singles with outside cylinders 15 in. by 24 in. Nos. 13, 14 and 15, were 6 wheel 6 ft. singles (rear drivers) with outside cylinders 15 in. by 24 in. Nos. 16 to 29 were 4 ft. 9 in. six-wheel coupled locomotives with inside cylinders 15 in. by 24 in. while Nos. 30 to 39 were six-wheel 5 ft. 7 in. four coupled locomotives with outside cylinders 15 in. by 22 in.

With regard to accidents the Norfolk Railway have, like other companies, had their fair share. In December 1845, the engine of the 11.15 a.m. *ex* Norwich ran off the line after passing Harling Road, when both the driver and fireman were killed. In the beginning of January 1854, a heavy snow storm occurred in the neighbourhood of Thetford, and on the morning of 4th January the down line which had been cleared was being worked under the rules for single line working. Two trains having arrived at Thetford, it was arranged to try and take them through to Harling Road on the up line. As it happened, however, a special train with some of the permanent way staff and workmen arrived at Harling Road, and the official in charge proceeded onwards to Thetford, in spite of the station masters objections, with the result that the two trains, each headed by two engines, met near where Roudham Station is now situated, and six people were killed and three injured. Another serious accident occurred on the Norwich and Yarmouth section of the line, near where Whitlingham Junction Station now stands. On 10th September, 1874, the 5.0 p.m. express *ex* Liverpool Street was allowed to leave Norwich for Yarmouth on the understanding that it would cross the up London Mail at Brundall, the line being then a single one. In the meantime, however, the up Mail had been allowed to leave Brundall, in order that it might arrive at Norwich in time to save any further delay to the down express. The two trains met head on near Thorpe Village, both being wrecked, with a casualty list of 25 killed and 73 injured. Again on 1st January, 1876, a passenger train headed by two tank engines left the rails between Oulton Broad (formerly Mutford) station and Somerleyton when rounding a curve, with the result that 13 were killed and 4 injured.

The time table for September, 1845 (see p. 390) shows that the quickest train between London and Norwich either way was the 11.30 both up and down, which took 5½ hours, while two other down trains took 6 hours 10 minutes. On the up journey one train took 6 hours and another



MAP SHOWING THE NORFOLK, LOWESTOFT, EASTERN COUNTIES AND OTHER RAILWAYS IN THE NORWICH DISTRICT.

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6 hours 10 minutes. There was only one third class train each way, which terminated at and started from Ely. The night mail took 6 hours 5 minutes on the down journey, and 6 hours on the up. On the Norwich and Yarmouth line the mail trains, both up and down, and the 2.45 p.m. down and 5.30 p.m. up trains, took 45 minutes, while all the other trains took 50 minutes with the exception of the 5.30 a.m. up booked in 40 minutes.

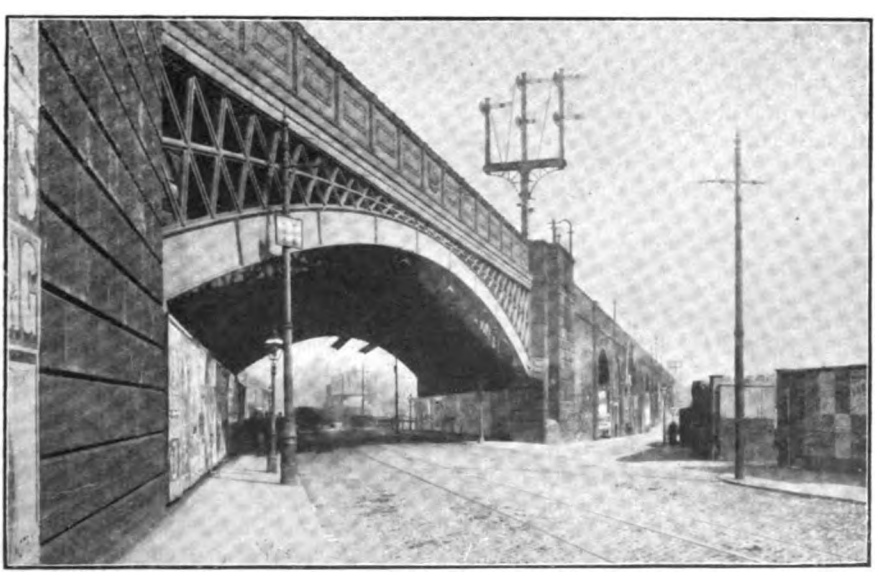
In March 1866, the one express of the day (the 5.0 p.m. *ex* Bishopsgate Street), took 3 hours 33 minutes, stopping at Bishop's Stortford, Cambridge, Ely, Wymondham and Trowse, while the corresponding up express (the 7.30 a.m. *ex* Norwich), took 3 minutes less, passing Trowse, but stopping at Stratford, the other stops being the same as the down train. The down day mail took 4 hours 51 minutes, and the night mail 5 hours 55 minutes for the journey. The up night mail (there was no up day mail) was allowed 6 hr. 15 min. Between Norwich and Yarmouth, the down night mail took 45 minutes and the up night mail 65 minutes, of the rest, the quickest down train taking 45 minutes and the up train 50 minutes.

In September 1911, the quickest down train between Liverpool Street and Norwich occupied 3 hours 10 minutes, and the quickest up 3 hours 14 minutes. The last down train at night, which corresponded to the old night mail, took 3 hours 53 minutes, and the corresponding up train 4 hours 35 minutes. On the Norwich and Yarmouth section the trains representing the old night mails were still allowed 45 minutes down, but only 38 minutes the other way. Of the other trains the fastest down took 37 minutes and the fastest up 38 minutes for the journey.

At first all trains travelled *viâ* Stratford, but since June, 1872, when the Hackney Downs, Clapton and Copper Mills Junction loop was opened, the Cambridge trains have all travelled over that route, saving a mileage of 2 miles 22 chains.

In conclusion the writer has to acknowledge the kind assistance of Mr. Herbert Rake in the compilation of this article.

Skew Bridge across Store Street, Manchester, London & North Western Railway.



We are indebted to Mr. Herbert Rake for the interesting photograph reproduced above.

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Railway Development in Fifeshire.

By TOM MOFFATT.

Photo] [*A. F. Shoults.*

CLASS "A" GOODS TRAIN AT BURNTISLAND.

Large goods engine No. 369.

THE development which has taken place in Fifeshire within recent years has been unsurpassed in any other county in the kingdom. Owing to its immense mineral wealth and the existence of many natural harbours in proximity to the coal-bearing areas, as well as the exceptional attractiveness of the almost unbroken chain of charming seaside resorts which stretches round its eighty miles of varied coast line, the district has been favoured by a combination of natural advantages not to be found in any other part of Scotland or England.

Fifeshire has always occupied a prominent place in Scottish history, but there may be said to be three outstanding events which have particularly contributed to the placing of the county in the substantial and flourishing position in which it stands to-day—(1) the discovery of coal; (2) the founding of the "Royal and Ancient" game of golf; and (3) the advent of the Iron Road.

No definite information is obtainable regarding the discovery of coal in the district, and the earliest record of its having been raised goes back to 1291 when William de Oberville granted a charter to the Convent of Dunfermline to open a coal-pit on his estate of Pityncrieff. The output of coal now reaches about 8½ million tons per annum. Golf may be said to date back to 1754 when the Royal and Ancient Club was founded at St. Andrews, the headquarters of golf, where are framed the rules of play governing the sport throughout the world. There are now in Fifeshire alone no fewer than thirty golf courses.

As far as railways are concerned, while the Edinburgh, Perth and Dundee Railway (opened in 1846) was the first modern railway to break the virgin soil of the county, it is interesting to note that from a very early period a line, known as the Halbeath Tramway, was worked in Fifeshire. The Halbeath Tramway was formed towards the close of the eighteenth century by a number of colliery proprietors and others in the vicinity of Halbeath, for the conveyance of minerals to the harbour of Inverkeithing on the Firth of Forth. The line was originally laid on the stone blocks so familiar in early railway history, and the several specimens of these which are still to be found in their original positions on the route of the Halbeath line are of unique interest.

For many years prior to 1846 the North British Railway had been making strenuous efforts to obtain an independent line of their own to the North through Fifeshire, and when the Edinburgh, Perth and Dundee Railway's original Bill was thrown out on Standing Orders on account of defective plans, the North British Company had the matter actively in hand. The Halbeath Tramway lay very much in the course of a part of the proposed line and branches of the Perth Company, and in their anxiety to secure the best route to the North, as well as to guard against the danger of a route through Fifeshire being seized upon by their rivals, the North British Railway, in conjunction with the Perth Company, concluded the purchase of the tramway. The Perth line was to have been taken through Glenfarg by very much the same route as the railway which was eventually made in connection with the Forth Bridge route to the North. The Halbeath route, however,

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appears to have been abandoned. The line continued for many years to be worked by means of horse power, but it was closed for traffic in 1871, and the rails, which weighed 25 lbs. to the yard, were afterwards removed. The site of the tramway has never been made use of, except at one or two points where it is crossed by the main lines and branches of the North British Railway, and it is now an interesting relic of bygone days.

With an area of 322,844 square miles, the Kingdom of Fife is situated on a peninsula jutting out into the North Sea, and it is bounded on the North by the Firth of Tay, and on the South by the Firth of Forth. It will thus be seen that, notwithstanding its present remarkable prosperity, its development in the past has been severely handicapped through the serious disadvantages which have had to be contended with owing to its isolated position.

ABERDOUR STATION.

The great barriers of the Forth and Tay presented such formidable problems to the railway engineers that until within comparatively recent times the railway system of Fifeshire was almost cut off from the main trunk lines of the country. Prior to the opening of the Forth and Tay bridges the traffic had to be worked across the Firth of Forth by the steam ferries between Granton and Burntisland, and between North and South Queensferry, while the traffic to and from the North was conveyed across the Firth of Tay between Tayport and Broughty Ferry. Although schemes for the bridging of the Forth and Tay had been discussed at a very early period in railway history, it was not until the nineteenth century was well advanced that the work was actually taken in hand and completed. Owing, perhaps, to its being the less ambitious from an engineering point of view, the bridging of the Tay was the first to be gone on with, and on June 1st, 1878, Sir Thomas Bouch's ill-fated viaduct was formally opened for public traffic. As is well known this fragile structure, which carried only a single line of railway, collapsed during a terrific hurricane on the evening of December 28th, 1879, and the 4.15 p.m. mail train from Edinburgh to Dundee, which was passing along it at the time, was precipitated into the seething waters of the Tay, involving the loss of no less than seventy-four lives, everyone on board perishing.

This Tay Bridge was authorised by an Act of Parliament which received the Royal Assent as far back at July 15th, 1870, and shortly after its opening it received Royal patronage, when Queen Victoria crossed it on her way to Balmoral, Mr. Bouch then receiving his knighthood. Owing to the paralysing effect of the news of the disaster upon the railway and engineering enterprise of the time, there was considerable public feeling evinced against the scheme which was formulated for a new structure. It was not till 1881 that Parliamentary sanction was obtained for the erection of a new viaduct, and even then further delay was caused owing to a question

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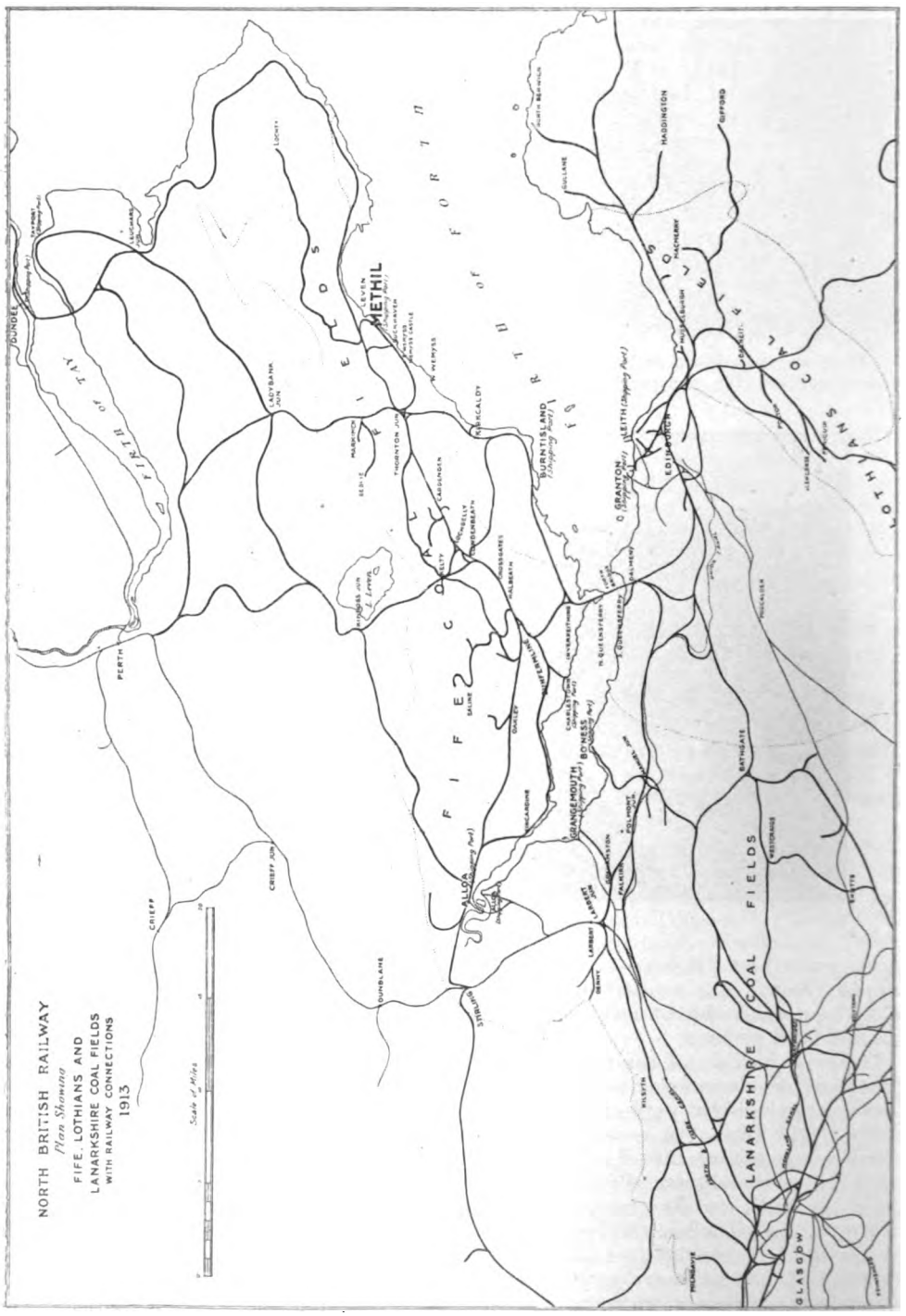

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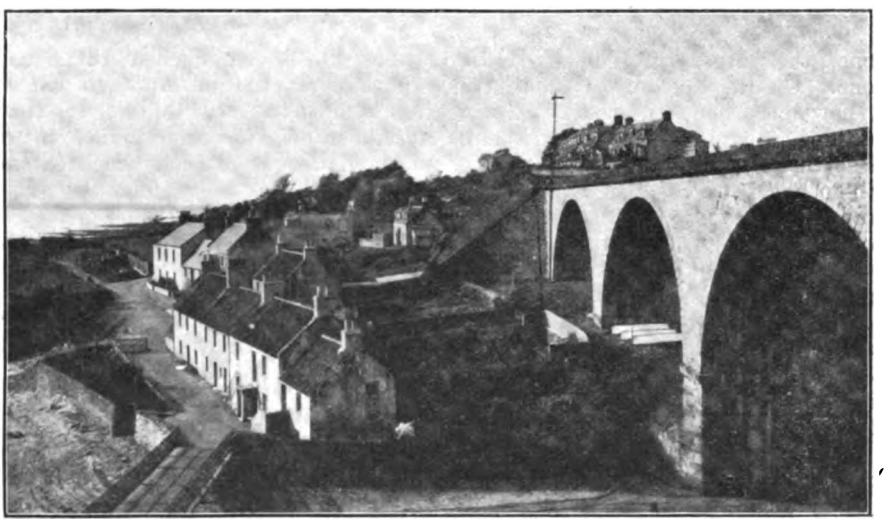
being raised by the Board of Trade anent the removal of the debris of the old bridge, and the work was not commenced till June, 1882. The new structure, which stands only about 20 yards to the west of the first one, was opened for traffic on June 20th, 1887, and it has thoroughly withstood the severe strain which has been put upon it during all these years. No better illustration can be got of the great strength the bridge is able to bear than the fact that it safely carries the largest express engines, which now weigh close on 120 tons, compared with those in use when it was opened for traffic, and which weighed only about 74 tons.

While the stupendous structure which spans the Firth of Forth at Queensferry has no such tragic history as that pertaining to the Tay viaduct, its story is, nevertheless, one of absorbing interest. It is without doubt one of the greatest of the world's triumphs of engineering genius and skill, but as it has so often been described and is so familiar to readers of the RAILWAY MAGAZINE, the writer does not propose in this article to give details regarding it.* Suffice it to say that the completion of the Forth Bridge, after seven years strenuous work, and its opening on March 4th, 1890, by the late King Edward as Prince of Wales, marked a new era for Fifeshire. It brought the county into direct communication with the main system of the North British Railway and enabled both goods and passenger services to be so improved that not only has the "Kingdom" since shown an immense industrial development, but it has become one of the most popular holiday districts, embracing by far the largest number of inland and seaside Summer resorts of any of the Scottish counties.

The North British Railway Company first obtained access to Fifeshire when, under, powers contained in an Act of Parliament passed in 1862, they took over the undertakings of the Edinburgh, Perth and Dundee Railway (78 miles) and the West of Fife Railway (15 miles). They thus secured control of the routes to Tayport (for Dundee *viâ* the Tay Ferry) and to Perth, as well as to the extensive coalfields in the county. From time to time since that date, by extensions, amalgamations, and working agreements, they have gradually opened up the more important and remunerative districts, with the result that the county, in which a capital of close upon twenty-five millions sterling has been sunk by the Railway Company, is now served by a network of lines representing upwards of 250 miles.



RAILWAY VIADUCT AT LARGO, LEVEN AND EAST OF FIFE SECTION.

The main line to Dundee and the North *viâ* Kirkcaldy and Thornton Junction, originally terminated at Burntisland, where all traffic between the North of Scotland and Fifeshire and the South had to be conveyed across the Firth of Forth, *viâ* the historic Granton Ferry, which was purchased by the Railway Company in 1846, from the Duke of Buccleuch and Sir Robert

* A complete description of the Forth Bridge appeared in the RAILWAY MAGAZINE, April, 1910.

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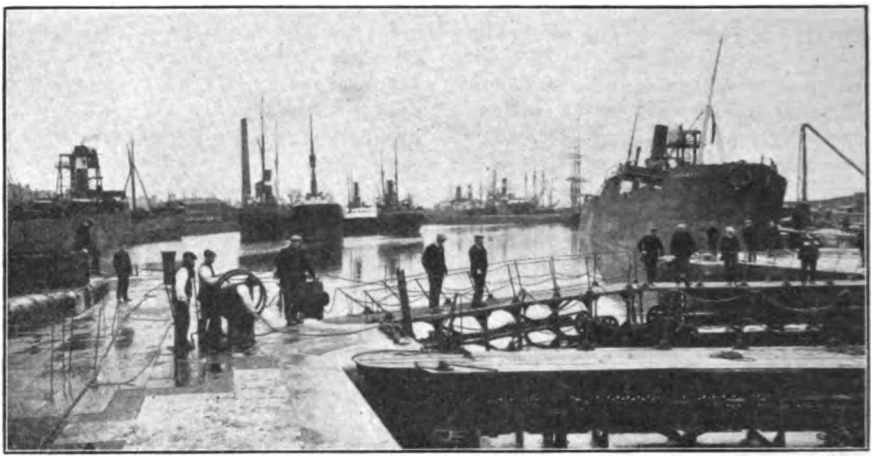

METHIL DOCKS.

Gladstone, the father of William Ewart Gladstone. On the opening of the Forth Bridge, new lines along the coast between Inverkeithing, Aberdour and Burntisland, as well as through Glenfarg, *viâ* Mawcarse Junction to Bridge of Earn for Perth, were at the same time brought into use for traffic, thus completing the North British Company's through routes and for the first time enabling them to compete effectively for the valuable traffic passing between England and the North of Scotland, *viâ* Aberdeen as well as *viâ* Perth.

From Mawcarse Junction to Bridge of Earn, the railway passes through a countryside of considerable beauty, and the charming river and glen scenery which are revealed as the train wends its way through lovely Glen Farg maintain the interest of passengers who choose the Forth Bridge route to Perth and the North.

The principal lines in West Fifeshire converge in the vicinity of Dunfermline; which is situated on the southern border of the West of Fife coalfield. The line which pierces the western border of the county going in the direction of Alloa to Stirling was formed by the Stirling and Dunfermline Company under an Act passed in 1846. It was opened on August 28th, 1850, and twelve years later the undertaking was merged in the Edinburgh and Glasgow Railway and became the property of the North British under the North British and Edinburgh and Glasgow Railways' Amalgamation Act of 1865. To the south, and running along the coast almost parallel to the Stirling and Dunfermline line, the Dunfermline and Kincardine branch, opened in 1906, connects up the branch from Alloa to Kincardine. At Valleyfield, near Culross, on the Dunfermline and Kincardine branch, a valuable field of navigation coal, which extends for upwards of two miles under the bed of the Firth of Forth, is now being opened by the Fife Coal Company, Ltd., and as the workings are further extended it is anticipated that a very large tonnage will be raised.

To the north of Dunfermline the West of Fife section strikes northwards and at Kelty it joins the main line to Perth. Kelty is another busy centre of the West of Fife coal mining industry, and from this point a large number of mineral lines serving the northern portion of the coalfield radiate. On the Perth road, about 5 miles from Dunfermline, the line known as the Dunfermline branch strikes off at Cowdenbeath South Junction in an easterly direction, and passing through a very rich portion of the coalfield which is connected up by a number of subsidiary mineral branches, it joins the Dundee main line at Thornton Junction. From Foulford Junction on the Dunfermline-Thornton branch the Kirkcaldy and District mineral railway, 7½ miles in length, runs in an easterly direction towards the south coast of the county and joins the main line at Invertiel Junction, Kirkcaldy. It forms an additional road to Burntisland Dock, where the vast output of the West of Fife coalfield is shipped. The line was constructed by the Kirkcaldy and District Railway Company, under powers conferred upon them by an Act of Parliament of 1883, incorporating the Seafield Dock and Railway.

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and it was opened for traffic on March 3rd, 1896. This latter Company was re-named the Kirkcaldy and District Railway Company and the undertaking was absorbed by the North British Railway under Parliamentary sanction obtained in 1895.

From a point on the Dundee main line near Kirkcaldy station, a branch runs down to Kirkcaldy Harbour, where upwards of £100,000 was recently expended by the Burgh in dock and pier extensions. The dock is, however, handicapped owing to the difficulty experienced in working rail traffic into it by the branch line which has the exceedingly steep gradient of 1 in 20. Only eight loaded mineral wagons, to which a special brake truck must be attached, can be worked down the incline at one time, and the speed is restricted to 4 miles per hour.

Nearly three miles beyond Kirkcaldy is Thornton Junction, the most important railway centre in Fifeshire. Situated in the heart of a busy mining district with a network of rails on every side, the station with its immense marshalling yard and storage sidings, passes more mineral traffic than, perhaps, any other junction in Scotland. A very heavy passenger traffic is also dealt with at the station, where a stop is made by most of the main line expresses, and it is also the starting point for a large number of local and branch trains. From Thornton Junction a branch, 5½ miles in length, extends to Methil Dock on the Firth of Forth, and this line, along with the original dock undertaking, was purchased from Mr. R. G. E. Wemyss in 1889, at a total cost of £227,000. The Leven and East of Fife line, also branching off at Thornton, follows the coast line right round to St. Andrews, from whence a branch (opened on July 1st, 1852) connects up to Leuchars Junction on the Dundee main line. From Thornton to Kilconquhar the line was constructed in two portions, *i.e.*, the first portion as far as Leven was made by the Leven Railway Company, being opened for traffic on July 3rd, 1854, and the second portion was constructed by the East of Fife Railway Company and opened on August 8th, 1857. The two concerns were amalgamated by an Act of Parliament of July 22nd, 1861, under the title of the Leven and East of Fife Railway Company, which at the same time were granted powers for an extension to Anstruther, and this latter portion was opened on September 1st, 1863. By an Act of Parliament which received the Royal Assent on June 28th, 1877, the Leven and East of Fife undertaking was amalgamated with the North British Railway. No further extensions were made in the district until the Anstruther and St. Andrews Railway Company was incorporated on August 26th, 1880, for the construction of the remaining portion of line to connect up St. Andrews, 15 miles distant. Opened in two sections, viz., from Anstruther to Boarhills, on September 1st, 1883, and from the last-named place to St. Andrews on May 31st, 1887, the complete undertaking was amalgamated with the North British Railway under powers contained in an Act of Parliament of July 15th, 1897, and thus completed the North British Company's East of Fife coast system. It is interesting to note that the Leven and East of Fife Company was one of the few small independent railways which worked their own traffic prior to amalgamation with the North British Company.

From a point between Cameron Bridge and Leven on the East of Fife line, a goods and mineral branch of about 14½ miles, runs

BURNTISLAND DOCKS.

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as far as Lochty and serves a rich agricultural district in which there is also a considerable output of coal. The line was constructed by the East Fife Central Railway Company under powers contained in an Act of Parliament of August 24th, 1893, and it was opened for traffic on August 21st, 1898, having been merged in the undertaking of the parent Company three years prior to the latter event.

Returning again to the Dundee main line we find the branch which opens up the rich farming district to the north of the Lomond Hills, stretching westwards to Mawcarse Junction on the main road to Perth. This railway was formed by the Fife and Kinross Company and extended to Kinross where it joined the Kinross-shire Company's line which ran southwards as far as the Dunfermline branch. Both these interesting old lines were merged in the Edinburgh, Perth and Dundee Company prior to the vesting of its undertaking in the North British Company.

The only portion of line within the county remaining to be noticed is that stretching from St. Fort on the Dundee main line to Newburgh on the Ladybank-Perth branch, which is the property of the Newburgh and North Fife Railway. Incorporated by an Act of August 6th, 1897, with a capital, including borrowing powers, of £240,000, the independent Company, owing to financial and other difficulties, were unable to arrange for the construction of their undertaking until June, 1906, when a commencement was made to the work, and the line, which is 13¼ miles in length, was opened for public traffic on January 25th, 1909. The new railway opens up a rich agricultural country and a fine residential and holiday district. Its chief source of revenue, however, is from the through traffic it accommodates, and the North British Railway is bound, under an agreement scheduled to the Newburgh Act, not only to work the line in perpetuity, but to send over it every description of traffic for which it forms the shortest route.

As has already been noted the prosperity of Fifeshire is in a great measure due to the immense value of the mineral resources of the county. It is estimated that there is available coal at a depth of less than 4,000 ft., representing something like 5,700,000,000 tons, or sufficient to maintain the present output for about 650 years. In ten years the output has almost doubled itself, and the shipments last year, amounting to 6,268,156 tons, constituted a record. With the exception of the small harbours of Charlestown, Dysart and Wemyss, the whole dock and harbour accommodation in the county, with a total water area of about 60 acres, is under the entire control of the North British Railway. The chief export trade is carried on through the ports of Methil and Burntisland, which are conveniently situated in proximity to the principal coal areas of the district. The combined tonnage dealt with at these ports during 1913, represented the enormous total of 5,627,361 tons. Both ports are fitted with the most modern hydraulic coal hoists and other appliances for the manipulation of cargoes and prompt despatch of vessels. Burntisland, it may be mentioned, was one of the first ports in the country to adopt the modern coaling hoist which has so revolutionised the shipping trade.

It is interesting to note that the yearly coal shipments at Burntisland and Methil were almost equal 20 years ago, being respectively 726,815 tons and 727,680 tons. Since that time, however while Burntisland has made a steady advance, passing 2,403,063 tons last year, Methil has expanded to the enormous tonnage of 3,224,298 tons. To cope with the vast development which has taken place in the export trade it has been necessary from time to time to greatly increase the facilities and accommodation for shipping at Methil

Photo] [*Tom. M. L. Neish.*

1.20 P.M. ABERDEEN-EDINBURGH LUNCHEON CAR EXPRESS APPROACHING LEUCHARS JUNCTION. 4-4-0 locomotive No. 332.

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and Burntisland, and the total capital expenditure on docks and railway connections at the two ports now represents a sum of considerably over two million pounds. The last extension to be carried out consisted in the provision of an additional wet dock at Methil, with a water area of 16¼ acres, which, with the necessary railway works, involved an outlay of close on £800,000. This great dock was formed on about 40 acres of land reclaimed from the sea by the erection of an immense sea wall running along low water mark from the pier at Methil to the mouth of the river Leven, a distance of about one mile. This wall, which has a concrete base of from 35 to 40 ft., rises to a height of 13 ft. above high-water mark, and many of the concrete blocks used in its construction weighed as much as 50 tons each. The whole of the docks at Methil are fitted up with a complete system of the most modern hydraulic machinery for the prompt handling of shipment coal traffic, and as the port is now fully equipped for dealing with considerably over 100,000 tons a week, it is anticipated that no further extensions will be required at least for some time to come.

No description of Fifeshire would be complete without a reference to the immense naval dockyard which is at present in course of construction at Rosyth. The latest scheme of the Admiralty involves an expenditure of £1,500,000 on the works connected with the Naval Base, and while the first proposal was to put down one dock, since then a second dock was ordered, and within the past few months it has been decided to go on with a third dock. When the works are completed, about 1916, Rosyth will have the three largest docks in the world, and when these are fully occupied it is calculated they will have a capacity for repairing and attending to some thirty battleships. The Base is situated in St. Margaret's Bay, on the north shore of the Firth of Forth, immediately to the west of the Forth Bridge, and it is connected with the system of the North British Railway by means of a private line running on to the Inverkeithing Harbour branch. In a recent statement by the Admiralty's Engineer, he estimated that within six years there would be at least 30,000 people in residence in the neighbourhood of the dockyard, and it will, therefore, be seen that the future development of Fifeshire, apart from the mineral output, will in a very great measure be affected by the Admiralty's new scheme. Navigation coal of a quality equal to that supplied to the Admiralty in South Wales has been tapped at several of the Fifeshire collieries, and there is every likelihood that in the very near future considerable Government contracts for fuel will be placed in the district.

The natural resources of Fifeshire for development are so enormous that it would take a very long article to really do the subject justice, and as space is limited on the present occasion, the writer will close with a few remarks regarding the holiday facilities of this wonderful county. The seaside resorts of Fifeshire have a quaint natural charm of their own, and in no case has the lovely sandy shores been impaired by the erection of promenade piers or the other artificial adornments to be found at the majority of the English resorts. The most favoured of the Fife holiday haunts are on the South shores of the county from Aberdour right round to Fife Ness and St. Andrews, and every one of these can boast of a golf course. Sea-bathing and boating facilities are of the best and from every one of the little towns interesting excursions can be made to Rosyth, St. Andrews, Dunfermline, Loch Leven Castle, and other places both famous and historical.

The fine fleet of steamers of the Galloway Saloon Steam Packet Company, which ply on the Firth of Forth, call regularly at several of the Fifeshire watering places. Interesting and delightful excursions can be made by them to the Forth Bridge and the May Island, as well as to many of the pretty towns on both sides of the Forth, and their excellent services afford a charming addition to the many attractions of this popular holiday district.

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The Railways of Somerset.

By HERBERT RAKE.

COAT OF ARMS :
SOMERSET AND DORSET JOINT RAILWAY.

THE Somersetshire main lines of railway have already received passing notice in articles published in the RAILWAY MAGAZINE dealing with the Bristol and Exeter Railway (Vol. X., p. 144); the Great Western Railway's new route to Weymouth (Vol. VII., p. 74); the Somerset and Dorset Railway (Vol. XVI., pp. 69, 116); and the London and South Western Railway route to Plymouth (Vol. XV., pp. 56, 131, 221), each of which, or their branches, traverse portions of the county. There are, however, several subsidiary lines which, from the beauty of their immediate surroundings, appear to claim special notice, in which category we may include more particularly the Cheddar Valley, Somerset and Dorset (Bath Extension), Wilts., Somerset and Weymouth, the West Somerset, and the Devon and Somerset lines.

THE CHEDDAR VALLEY RAILWAY.

This railway reveals the most wonderful succession of panoramic views to be met with in the county, as it pursues its course along the southern flank of the Mendip Hills. This remarkable ridge consists of mountain limestone overlaying the old red sandstone raised by volcanic action from the bed of an ancient sea. Fractures and dislocations due to so violent an upheaval are to be seen at Cheddar and other points in the Mendips, also in the Avon gorge, where have been found rents discharging igneous rocks, probably giving rise to existing hot and saline springs.

The range of the Mendip Hills is about 20 miles long by 3 to 5 miles wide, running from North-West to South-East, and is from 200 to over 1,000 ft. high, the greatest altitude attained being Black Down, 1,067 ft. high. Originally the railway was projected to run from Wells to Axbridge along the Southern slope of the Mendips, there striking the valley of the Axe, and continuing along the course of that river and crossing the Bristol and Exeter line near Uphill to reach Weston-super-Mare, which at that time was very indifferently served by a branch line of the broad gauge from Weston Junction.

The Somerset Central Railway, authorized in 1852, afterwards the Somerset and Dorset Railway (hereafter referred to), had reached, in 1859, as far as Wells, only 20 miles from Bristol; and being desirous of getting access to that city in their own right, they appear to have persuaded the Cheddar Valley promoters to abandon, or at least postpone, the construction of their railway west of Axbridge, and join with them in promoting a junction railway from Wells to the village of Farrington-Gurney, near which place the line was to join the Bristol and North Somerset Railway, sanctioned in 1863 as a narrow gauge line for the purpose of connecting Bristol with Radstock and the Somerset coalfield. The Bristol and Exeter Company, however, were not to be outwitted, and under an offer to subscribe the whole of the capital required for the construction of the Cheddar Valley line, they acquired the rights and so far

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controlled its destinies, as to get powers for a deviation from the original proposed line at Axbridge in a north-western direction to their own main line near Yatton, with a further modification in respect of the gauge to be adopted.

Amended powers were obtained in 1866, and the first sod was cut at Axbridge February 25th, 1867, with an imposing ceremony to befit what was regarded as a great broad gauge triumph, although the total length of the line did not exceed 17¾ miles. The railway, on leaving Yatton Junction, 12 miles south-west of Bristol, crosses the river Yeo, near Congresbury, the first station. Four and a half miles farther on is Sandford for Banwell, noted for its bone caves, in which have been found embedded in the limestone the remains of the bear, buffalo, wolf, fox and other animals.

By easy undulating gradients the railway now ascends to Winscombe station, 5¾ miles, near which it encounters Shute-Shelve Hill, an outlying spur of the Mendips, which it pierces by a tunnel 154 yards long driven through hard shale and mountain limestone. On emerging, the line continues through a heavy cutting as it descends from the summit level, about midway in the tunnel, to Axbridge, a distance of 8 miles. Axbridge is a very ancient town and a central depôt for the celebrated cheeses and the agricultural produce of the Cheddar Valley.

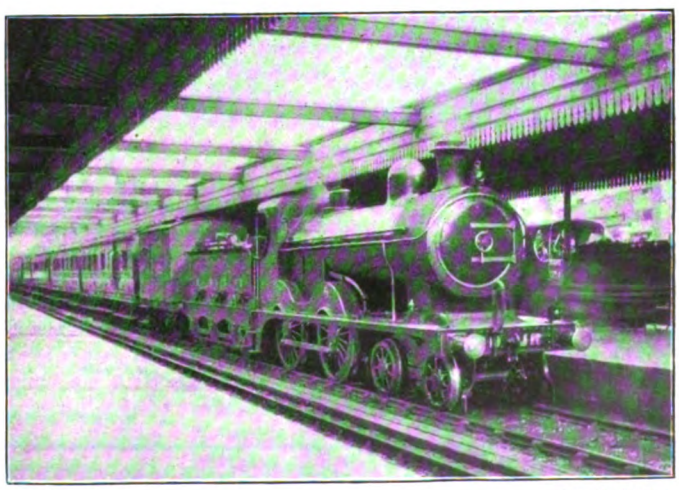
Still gradually descending, the line at 9¾ miles reaches Cheddar station, to which it was opened on August 3rd, 1869. The tremendous chasm constituting the Cheddar cliffs is about a mile from the station, greeting the visitor in all its grandeur as he approaches, the full wonder of the site being, however, only revealed when fairly within the defile. The narrow road beneath is over a mile in length, winding upwards between vast perpendicular heights, inaccessible slopes, craggy peaks, and overhanging masses of rock, until the top of the south-western ridge of the Mendips is reached.

In some places the cliffs attain an altitude of over 500 ft., and at their feet nearest the village, nine springs issue from the crevices of the limestone. These springs afterwards unite to form a romantic lake, while the gigantic "Lion Rock" frowns from the hillside to the left, like a gigantic warden of the entrance to the pass.

In one portion of the defile are fantastic pinnacles imparting so curious a resemblance to an ancient fortress, with its time-worn battered walls, towers and battlements rising perpendicularly from the grey limestone, the face of which is indented at intervals by lines of apparent joints, that it has earned the appellation of the "Castle Rock." As the pass again turns, appear new groupings of grim deep-shadowed crags, with crevices in which grow the beautiful crimson Cheddar pink, and where also, from pure inaccessibility, is permitted to remain the Arbutus, and many a flowering shrub. Impressive always is the Cheddar gorge, as one of the noblest illustrations of natural grandeur that England knows.

Cheddar, it may be observed, is a convenient spot from which to visit the Saxon "borough of Wedmore." Here Alfred lived, here was made the peace of Wedmore, and here was kept the christening feast of Guthrum, who was baptised at Aller.

Draycott, the next station (11¾ miles), is succeeded by Lodge Hill (14 miles), amidst most attractive surroundings. Next comes Wookey, about 16½ miles, near which the Axe takes its rise in the midst of scenery regarded as wildly magnificent. In the side of the hill containing the source, is formed a



Photo] [*H. C. Doyne.*

SOMERSET AND DORSET JOINT RAILWAY:
4.50 p.m. Bournemouth-Bath semi-fast train.

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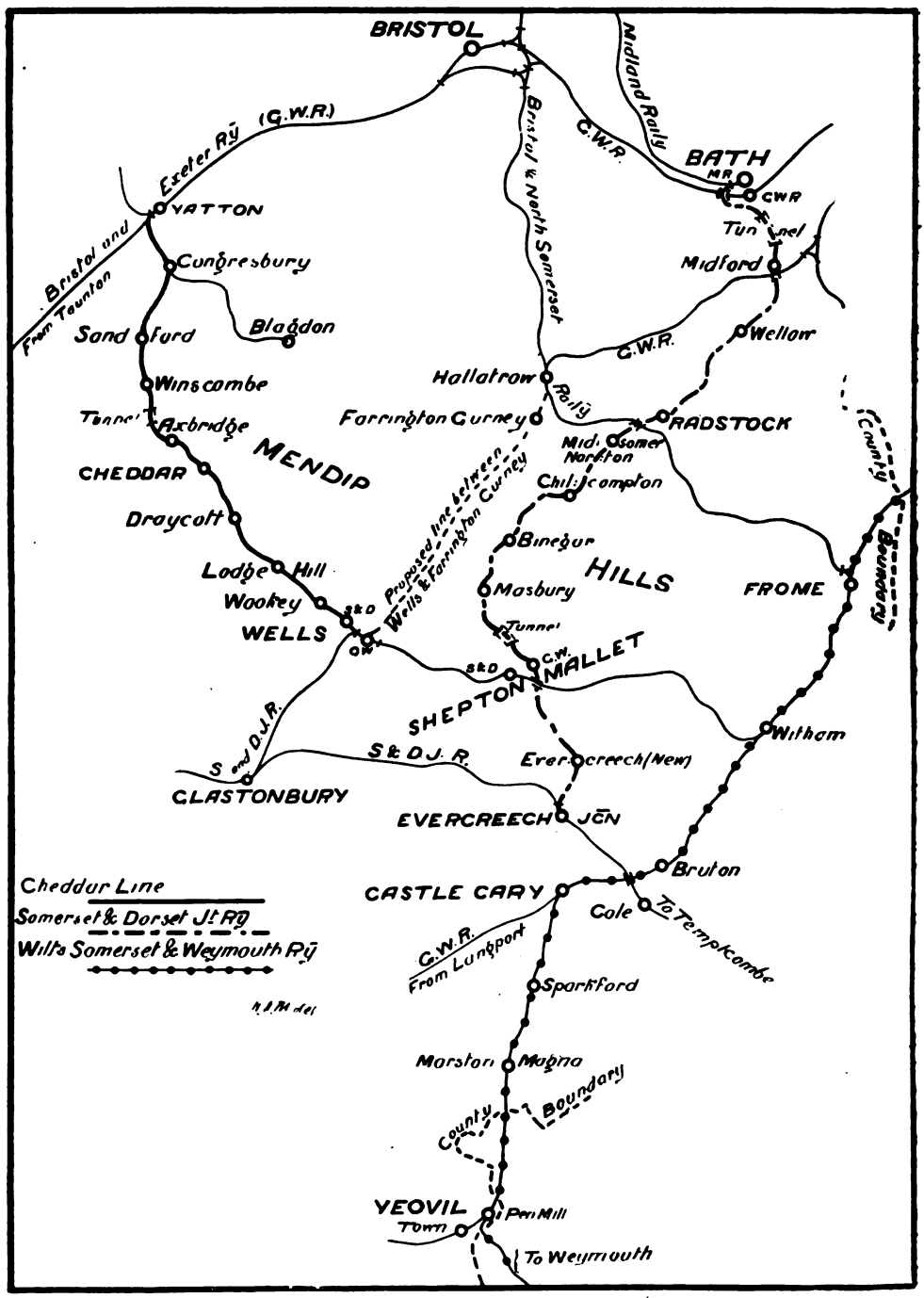

MAP SHOWING RAILWAYS IN SOMERSETSHIRE AND THEIR CONNECTIONS WITH THE GREAT WESTERN, SOMERSET AND DORSET JOINT AND OTHER MAIN ROUTES.

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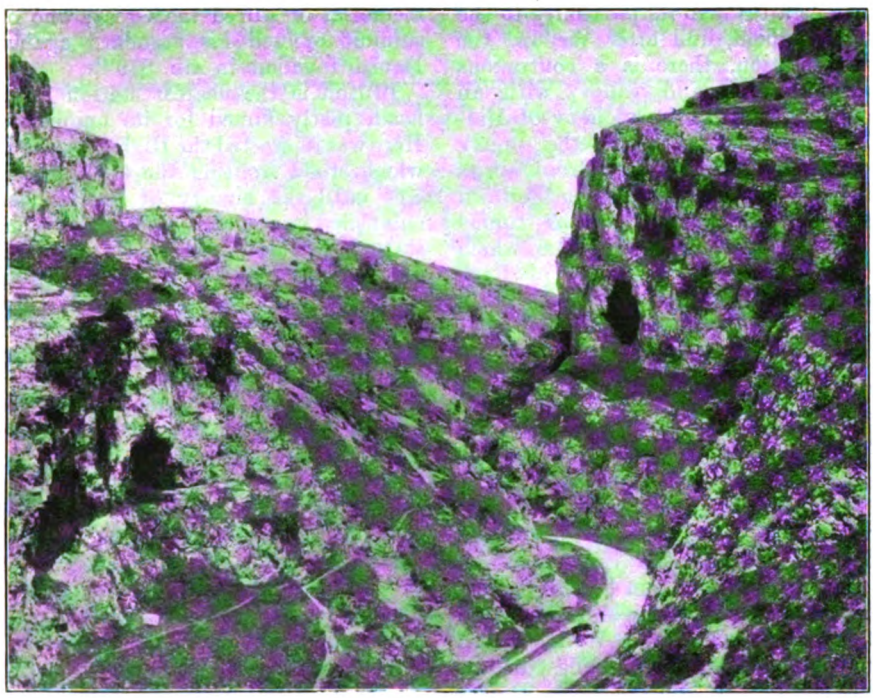
semi-oval cave or recess, 200 ft. across, the centre point of which is a series of vast perpendicular rocks rising to a height of 210 ft., almost covered with trees and shrubs springing from the fissures. At the extremity of the cave and at the base of the cliff is a natural arch, from which rushes a rapid torrent through a channel fringed with aquatic plants and mosses, on one side of which is a rocky terrace leading to the cavern's mouth. The cave is 500 ft. in length to the point where the river bars further progress, and in it have been found the cave lion, cave bear, hyena, wolf, fox, badger, woolly rhinoceros, elephant, bison, Irish elk, reindeer, and other animals. About 1 mile distant are the Ebbor rocks, regarded as another Cheddar in miniature.



THE GORGE, CHEDDAR.

At 17½ miles we reach the terminus at Wells, a Cathedral City of remarkable and almost unique interest, but too well known to need description here, except, perhaps, to observe that its origin dates from 908 A.D. When the diocese of Sherborne was divided it became the special bishopric of the Somersetas, and the Cathedral church of Wells, as we now know it, is the only one in England complete in all the parts and appurtenances.

A junction is formed at Wells with the East Somerset Railway, which, extending in a similar course to the Cheddar Valley along the southern flank of the Mendips through Shepton Mallet, terminates in a junction with the Wilts., Somerset and Weymouth Railway at Witham. Both of these companies now form an integral part of the Great Western system.

The Somerset and Dorset Railway. (Evercreech and Bath Extension.)

The Somerset and Dorset Company having failed in its scheme for a joint line from Wells towards Bath in conjunction with the Cheddar Valley Company, projected an independent line from Evercreech to Bath, where it joined the Midland Railway, this section being opened in July, 1874. This extension line commences at Evercreech Junction, 26½ miles from Bath (Midland station), and proceeds to Shepton Mallet amidst charming surroundings, ascending sharply at Masbury to the summit some 800 ft. above sea level, where it cuts through an outlying spur of the Mendips.

The views over the adjacent country all the way to Chilcompton, with the Bristol Channel and the Welsh coast in the far

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distance, are magnificent; in the foreground is Glastonbury Tor, rising from the centre of the green alluvial plain with other of the grassy mounds peculiar to Somerset, while the Mendips and the Quantocks bound the horizon to the west. Chilcompton is one of the most beautiful spots on the line, the village lying far down in a densely wooded glade, the upper edge of which is skirted by the railway, the station being 14½ miles from Bath. The line now descends rapidly to Midsomer Norton, another pretty village embosomed in the foliage of a wooded glade watered by the Somer which here forms a series of miniature cascades.

Radstock, the next station, owes its prosperity as a town to its proximity to the Somerset coalfield, and after Wellow, the succeeding station, there is a continuous interchange of hill and valley, with an occasional tunnel. In the vicinity of Midford the railway runs along the pretty valley watered by the Midford Brook on its way to the Avon. After leaving Midford station the line enters Midford tunnel under Combe Down, emerging from which it sweeps round the west side of Bath and proceeding eastwards, crosses the Avon and runs into the Midland terminus in that city.

The Wilts, Somerset and Weymouth Railway.

It is desirable to refer to this line, not merely for its attractive scenery whilst within the Somersetshire border, but also because, after its extension into the County of Dorset, it was at one time proposed during the early days to run holiday excursions from Weymouth, to include the scenic attractions of Cheddar and Wells, and a visit to Glastonbury, only 5 miles distant on a branch of the Somerset and Dorset line. The difficulty attendant upon there being three separate broad gauge interests to arrange with appears to have been an insuperable obstacle at that time, but now that these are each absorbed into the Great Western system it should be readily practicable.

The line enters Somerset about 3¼ miles north-east of Frome, to which town it was opened on August 3rd, 1856. Immediately on leaving the station it passes through the once extensive forest of Selwood, and on the left may be seen the woods surrounding Longleat—2,000 acres in extent—the seat of the Marquis of Bath, and claimed to be the very finest of all Elizabethan houses in the kingdom, and famed, no less for the beauty of its surroundings, than for the literary and art treasures which it enshrines.

Witham Friary, so-called from its being the site of the first Carthusian House founded in England, is the junction with the East Somerset line. The railway now runs through dense woods encircling Kingsettle Hill, on which, at an altitude of 950 ft., stands Alfred's Tower, a conspicuous landmark commanding a series of remarkable views. Over the entrance is a life-size statue of the Saxon King, with an inscription to the effect that the tower "is a memorial of Alfred the Great, who on this summit erected his standard against the Danish invaders in A.D. 879."

Bruton is the nearest station for Stourhead, justly famed for its unique beauty. Here was re-erected the High Cross of Bristol which stood fronting the Cathedral in that city until the bigotry of Puritan fanatics compelled its removal. Within its niches are statues of John, Henry III., Edward III., and Edward IV. The grounds of Stourhead contain the six springs forming the source of the river, which are collected and conveyed underground to a grotto, thence issuing into a lake from which flows the actual river. The surrounding wooded heights contain statues of various Grecian deities, the Pantheon and Temple of the Sun being among the ancient fabrics reproduced. The beauty of the adjacent country continues as far as Castle Cary, the next station, after which the scenery gets tamer. The railway was opened from Frome to Yeovil on October 7th, 1856, where it enters the county of Dorset.

The West Somerset Railway.

The entire absence of railway communication westward of Bridgewater along the Somersetshire coast line became so evident in the year 1855 that a scheme was formulated to connect, if possible, the Bristol and Exeter Railway at or near Bridgewater, with Watchet, to be extended at a later date further westward as opportunity offered. Watchet, a port on the Bristol Channel, is under the jurisdiction of Bridgewater, from which it is distant 18 miles. It possesses a harbour of limited extent, but a considerable trade is done in grain, flour, malt and timber, while the town boasts of a paper mill and an iron works, also numerous lime kilns; the

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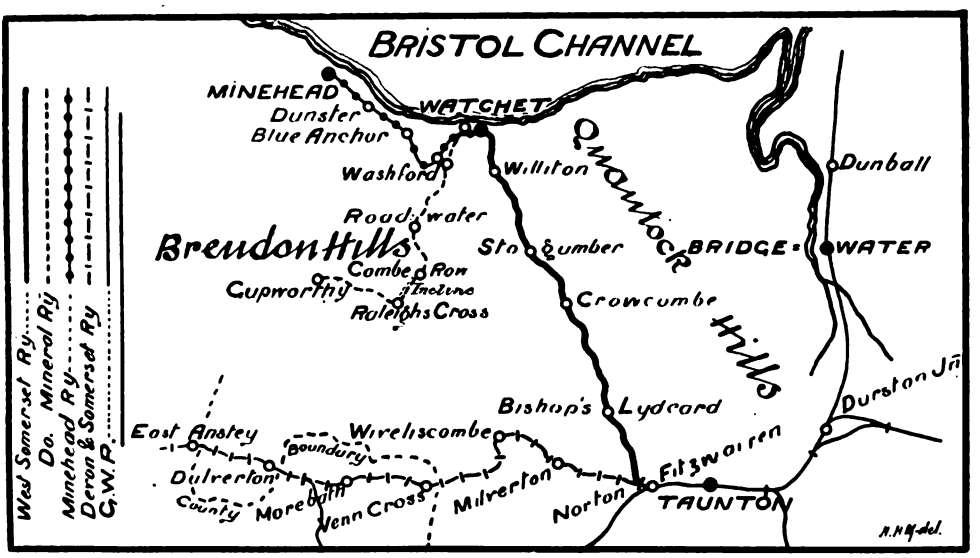
cliffs of the coast consist largely of Liassic limestone.

A mineral line had been projected 13½ miles in length, during 1885, to connect the ironstone mines of the Brendon Hills with the harbour at Watchet, whence iron ore was already being shipped to South Wales, coal being received in exchange for use at the lime kilns of the locality. The West Somerset Mineral Railway, as it was styled, on leaving the harbour at Watchet, crosses under the present West Somerset line, and curving slightly to the right, runs parallel to the latter at a distance of 30 to 40 ft. Approaching Washford it curves to the right and then enters the little mineral station at Washford. The gradients from here increase in steepness until after passing Watchet, thus securing a shortened sea route to the Western ports of South Wales, and avoiding the tortuous navigation of the river below Bridgewater. The great obstacle to any direct railway extension towards Watchet presented itself at the outset, in the range of the Quantock hills, which, running north-west towards the coast line in an irregular contour, offered no possibility of piercing by ordinary tunnelling operations, except at a prohibitive cost, while to avoid the Quantocks altogether would necessitate a considerable detour to the north. The Bridgewater scheme was accordingly abandoned in favour of a line to connect Taunton with Watchet, running in a parallel course with the Quantocks, but some distance westward, so as to take advantage of the



Roadwater, about 5 miles further on, the ascent being at 1 in 40 to the terminus at Combe Row.

Passenger trains, consisting of two coaches, a composite and a third-class only, and two or three trucks with planks stretched across them, were at first run, three times daily, but after being reduced to one train each way daily, were entirely discontinued. It was contemplated, in view of a direct railway extension from the east, to further increase the trade of Watchet by obtaining the sanction of the Admiralty to an extension of the harbour, so that the celebrated Bridgewater bricks and general pottery, cement, and other products for which the alluvial deposit of the river Parret is so peculiarly adapted, should be shipped at level plain from Norton Fitzwarren to near Bishops Lydeard and through Williton.

A meeting of influential landowners and others connected with the mineral district on the border of Devon and Somerset was then held at Williton on July 9th, 1856, for the purpose of promoting a railway to connect that neighbourhood and the mineral railway then in course of construction, from the Somersetshire iron works on the Brendon hills with the Bristol and Exeter Railway. A Committee was formed to obtain plans of the best line from the engineers, and report thereon to a future meeting. It was stated that the improvement of Watchet Harbour, just sanctioned by the Admiralty at an estimated cost of £10,000, would include a new breakwater giving an area of about

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ten acres of harbour where vessels could float at all times of the tide. The railway, 14¾ miles in length, from Watchet to Norton Fitzwarren Junction near Taunton, was estimated to cost £100,000.

A meeting of the inhabitants of Taunton was next held in the Guildhall there, on October 27th, 1856, for the purpose of promoting the proposed railway between Taunton and Watchet. It was determined that the line should be entitled, "The West Somerset Railway," and the meeting pledge itself to support in every way possible the project, leaving it to the discretion of the directors and engineer to make such arrangements as seemed to them desirable for effecting a junction with the mineral railway at Watchet.

That Company had arranged to extend their railway over the pier at Watchet, but the owners of the soil had succeeded in obtaining an injunction to restrain them from proceeding to make such railway until they had taken such steps under the Lands Clauses Act as they would be bound to take in the case of any other lands proposed to be taken for the purposes of the railway. The pier, it was stated, had been built upon the Manor of Watchet, and the trustees of the Manor insisted that even if it could be proved they were not owners of the soil the management of the harbour rested with them, and they had a right to prevent its being interfered with. The mineral Company on the other hand, insisted that the plaintiffs were not owners of the soil and that if they were, still the Company, under the terms of their Act, were entitled to take their railway over the pier without making any compensation.

It was held by the Court that the evidence showed the plaintiffs to be owners of the soil, that the pier was not a highway as was attempted to be shown, and that if it had been, still the Company had no right to take it for a fresh purpose without making such compensation as the Court might be advised to direct. The directors of the West Somerset Railway now appear to have decided against forming any junction with the West Somerset Mineral Railway, deeming it prudent to avoid the risk of being mixed up in any complication with its neighbour; moreover the engineer had advised that the levels near Watchet would not suit for any projected extension westward.

The Act for the West Somerset Railway was obtained in the Parliamentary Session of 1857, and the first meeting of the authorised Company was held at Taunton on February 10th, 1858. The chairman congratulated the shareholders on the success which had attended their application for an Act, to authorise the construction of the first section of what would be known as the West Somerset Railway from Taunton to the town of Watchet. The report stated that the total expenses up to the passing of the Act in August, 1857, did not exceed about £4,000. The directors proposed to take no steps whatever towards the construction of the line until they were enabled to calculate the cost of the land, but provided the land owners fairly seconded the efforts of the Company, it appeared to the directors that the works might be at once commenced. The estimated cost for the completion of the line, inclusive of the land, was fixed by the engineer at £130,000.

The Bristol and Exeter were to work the line when completed, finding the plant and maintaining the line at a rental of 45 per cent. of the gross receipts, with a minimum guarantee to the Company of £4,000 per annum. It was estimated that the guarantee would pay £3 per cent. on the outlay. The report was adopted unanimously and the appointment of the proposed directors was duly confirmed.

At the next meeting in the autumn of 1858 the report announced that the directors had come to an arrangement with the Bristol and Exeter Railway to lease the line in perpetuity, that Company finding all necessary plant and working the line as before, but paying to the West Somerset Company 55 per cent. of the gross receipts with a guarantee that such portion of receipts should not be less than £4,500 per annum. The railway, as now definitely laid out, was about 16 miles in length, commencing by a junction with the Bristol and Exeter line at Norton Fitzwarren, 4 miles west of Taunton, and terminating at Watchet. The construction of the line was commenced in April, 1859, during which year the Company had to deplore the loss of their Engineer, Mr. Brunel, who was, however, ably succeeded by Mr. Brereton, his chief assistant.

During 1860 negotiations were entered into with the Watchet Harbour Commissioners for the extension of the railway to the harbour, and at the end of 1861 the works of the West Somerset Railway had so far progressed that an Agreement was concluded with the Bristol and Exeter Company for working the line on completion.

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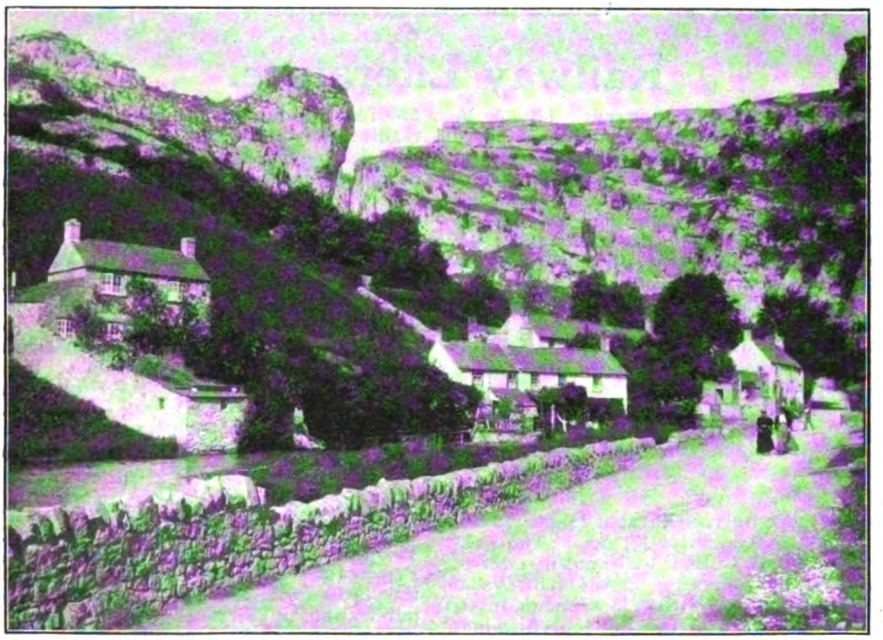
The line was opened to Watchet on March 31st, 1862, when it was proposed it should be leased to the Bristol and Exeter Company, and in 1863 that Company promoted a Bill empowering them to lease or purchase the whole undertaking.

In 1864 a Bill was promoted by an independent Company for powers to construct a railway from the terminus of the West Somerset Railway at Watchet to Minehead, the Act for which was obtained in 1865. The line was 8½ miles in length and proceeded through Washford, Blue Anchor and Dunster, terminating at a point adjoining the Esplanade at Minehead. This railway was opened in 1868.



THE LION ROCK, CHEDDAR.

Referring to the physical features which characterise the scenery through which the line passes, these commence with the long, low, rolling outline of the Quantocks, at Bishops Lydeard, the second station on the line, 5 miles from Norton Fitzwarren. At Crowcombe, 7 miles from the latter place, the well-wooded and fertile district so far passed through begins to give place to a more rugged country on the broken border of the Quantocks, "Wills Neck," their highest point, being 2 miles north-east. Stogumber, 2½ miles further on, is in the centre of a very pleasant country—a broad, broken bottom land between the Brendon and Quantock hills. Williton, 3¼ miles from Stogumber, commands the prettiest, if not the most striking, portion of the Quantock range. The line now reaches the shore of the Bristol Channel, which it follows fairly closely for some distance. Watchet, 16½ miles from Taunton, with some pretensions to a watering-place, has already been referred to as a port. The red cliffs of sandstone and conglomerate in the locality, alternating with variegated marls intersected by white bands of gypsum and contrasting with the more sombre shades of the Liassic limestone, give the coast a rich chromatic character peculiarly its own.

Cleeve Abbey, the ruins of which are in excellent preservation, was a Cistercian edifice, and lies 2½ miles south-west of Watchet, but in closer contiguity to Washford station, 18¾ miles distant from Taunton. The line turns inland between Watchet and Washford, and finds its way to the coast again at Blue Anchor, 21 miles, a pretty village watering-place, after which it arrives at Dunster, situated in the midst of some of the most beautiful scenery in Somersetshire. The town with its notable church and market cross, nestles under the hill. The grimly picturesque walls of Dunster Castle, with its magnificent park, command the view. At 20¾ miles Minehead is reached,

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the terminus of the West Somerset Railway.

THE DEVON AND SOMERSET RAILWAY.

This line was the last to be sanctioned on the broad gauge and must not be omitted from mention in an article devoted to the picturesque railways of Somerset, although only a portion of the line lies within the confines of the county. It was projected in 1863 to afford a direct route by the Great Western from Taunton to Barnstaple, and commenced by a junction with the Bristol and Exeter line at Norton Fitzwarren. The line on its way from Milverton, passes through a superb country amidst steep lofty hills mostly cultivated to the summits. Wiveliscombe, the next station, is embosomed in fine sylvan scenery. Venn Cross is followed by Morebath and Bampton. Dulverton, seated in an amphitheatre of wooded hills, is the last station in Somerset.

The line was incorporated by Act of July 29th, 1864, and by an Act in 1865, an agreement with the Bristol and Exeter Company was confirmed by which that Company was to work and maintain the line in perpetuity at 50 per cent. of the gross profits. It was opened from Taunton to Wiveliscombe (7¼ miles) on June 8th, 1871, and to Barnstaple (35 miles) on November 1st, 1873.

Railway Literature.

SUPERHEATING ON LOCOMOTIVES. [By J. F. Gairns. Fully illustrated; including a large folded chart of the Schmidt Smoke-tube Superheater. Price, 2s. 6d. net. By inland post, 2s. 9d. Abroad, 2s. 10d.] Republished in a second edition, this book has been considerably enlarged and revised in view of developments since the first issue. Besides including descriptions of the Robinson, Horwich and other superheaters now in favour, particulars are given of the Schmidt circulating system (in replacement of damper mechanism), the Robinson draught retarder, piston valves suitable for use with superheated steam, relief and release valves, the Fowler-Anderson special control, and other devices. Copies can be obtained from the offices of the RAILWAY MAGAZINE, 30, Fetter Lane, London, E.C.

* * *

RAILWAY MAP OF THE BRITISH ISLES. [John Bartholomew & Co. Price 1s. net.] The publishers have added to their well-known series of folding maps, one showing all the railways of the United Kingdom, with enlargements, inset, showing the railways of the London, Birmingham, Manchester, Glasgow and Edinburgh, Swansea and Cardiff, and South Lancashire and Yorkshire districts. These are very clearly printed, and accurately produced. The map is adapted to be folded within a convenient pocket cover. Copies can be had from the offices of the RAILWAY MAGAZINE at published price.

* * *

MODEL RAILWAY HANDBOOK. [Messrs. Bassett-Lowke, Ltd. Price 1s. net.] This is really a fifth edition of the handbook published several years ago, but appears in a new guise, at a slightly increased price, it is true, but produced on a larger scale, printed on art paper, and with many special features. It is, indeed, a volume calculated to be useful for reference, and worthy of preservation for other reasons, the fact that it is, primarily, an advertising catalogue being actually quite a secondary matter from the point of view of the general reader. With stout ornamental card cover, about 250 illustrations, and thirteen chapters of good reading matter dealing with various phases of model locomotive and railway engineering, it can be cordially recommended to our readers.

* * *

EAST COAST PICTURES. A new edition of Percy Lindley's well-known brochure, printed on art paper and with interesting letterpress, this will appeal to all lovers of East Anglia. Illustrations are varied, including characteristic holiday views and sketches. Hunstanton, Cromer, Sheringham, Overstrand, the Broads, Gorleston, Yarmouth, Lowestoft, Southwold, Aldburgh, Felixstowe, Dovercourt Bay, Harwich, Walton-on-the-Naze, Frinton-on-Sea, Clacton-on-Sea, Southend, and other places served by the Great Eastern Railway provide the principal subject-matter.

* * *

MEXICAN FUEL OIL. [George Philip & Sons, Ltd., 32, Fleet Street, E.C. Price 3s. 6d. net.] This book, issued on behalf of the Anglo-Mexican Petroleum Products Co., Ltd., goes far beyond the ordinary limitations of an advertising publication, in view of the increasing use of oil fuel for naval purposes, mercantile marine, railways, land plants and industrial furnaces throughout the world. It is claimed that Mexican oil fields furnish the largest fuel oil supplies available at the present time for Europe and the Atlantic side of the American Continent. Various uses are reviewed in appropriate chapters, one dealing with railway applications.

* * *

NEWCASTLE AND GATESHEAD CHAMBER OF COMMERCE YEAR BOOK AND COMMERCIAL REVIEW FOR 1914. [Published for the Newcastle Chamber of Commerce by Sells, Ltd. Price 2s. 6d.] The new issue of the "Newcastle Year Book" constitutes a useful manual concerning Newcastle, Gateshead, Sunderland and district. It consists of 230 pages of information, interesting and useful, with numerous illustrations and well bound. Railway and dock facilities receive attention, while descriptions of the principal manufacturing establishments in the area covered will well repay perusal.

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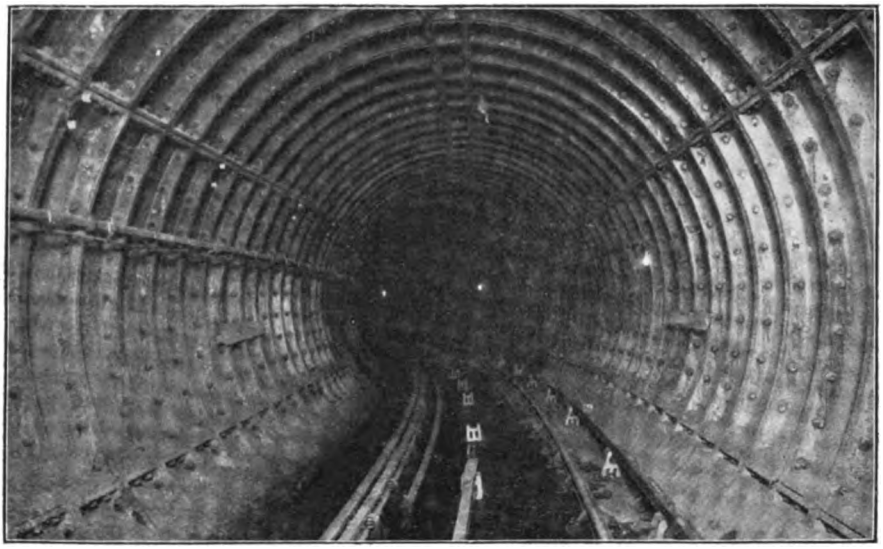

THE CENTRE OF THE LOOP UNDER THE RIVER.

Charing Cross as a Railway Centre.

ON April 6th the new loop platform at Charing Cross (Embankment), on the Hampstead section of the London Electric Railway, was brought into use, completing, except for work above ground, the great undertaking which has converted the District Railway station into one of the most remarkable railway centres in the world. Here are four railways almost superimposed, providing an interchange system which already ranks as one of the most valuable and important in the Metropolis. On the lowest level is the Bakerloo tube, with two platforms, its trains connecting North and South London by means of under-river tunnels, and its services linking up Paddington, Marylebone, Baker Street, and Waterloo directly. Twenty-four feet higher is the new platform of the Hampstead line. Each low level station is served by a pair of escalators leading to the booking hall and circulating area below the District station. Short stairways from this hall connect with the District platforms, and further stairways lead to the Embankment, with the London County Council tramways passing the doors of the station. Above ground is the South Eastern and Chatham terminus.

Full details of the work involved have already been given, and reference may be particularly directed to a comprehensive article published in the RAILWAY MAGAZINE, December, 1913. The importance of the work justifies, however, further reference.

The new loop is only half-a-mile in length, but it is unique as being the only tube line of its kind in the world. There is only one other terminal of this character in the United Kingdom—at Wood Lane, Central London Railway—but at Charing Cross the loop has to extend under the river for some distance, and its construction is also associated with the comprehensive interchange facilities now available for public use. Moreover, the new station is the only one with four escalators closely grouped, though at Liverpool Street (Central London Railway) there are also four, in two entirely distinct installations, serving respectively the Great Eastern terminus and Broad Street station.

A remarkable feature of the loop extension is the fact that it is on a sharp curve, though trains can pass safely and comfortably at 25 miles an hour round it, and that it does away with terminal work entirely at that end of the " Hampstead " tube.

As a traffic centre the new station is worthy of special remark. From and to the surface there are 10 routes of travel : to the District Railway east and west, to the Bakerloo Railway north and south, and northwards by the Hampstead line, with arriving passengers creating five corresponding general routes in reverse. Below ground, passengers pass from the District east or

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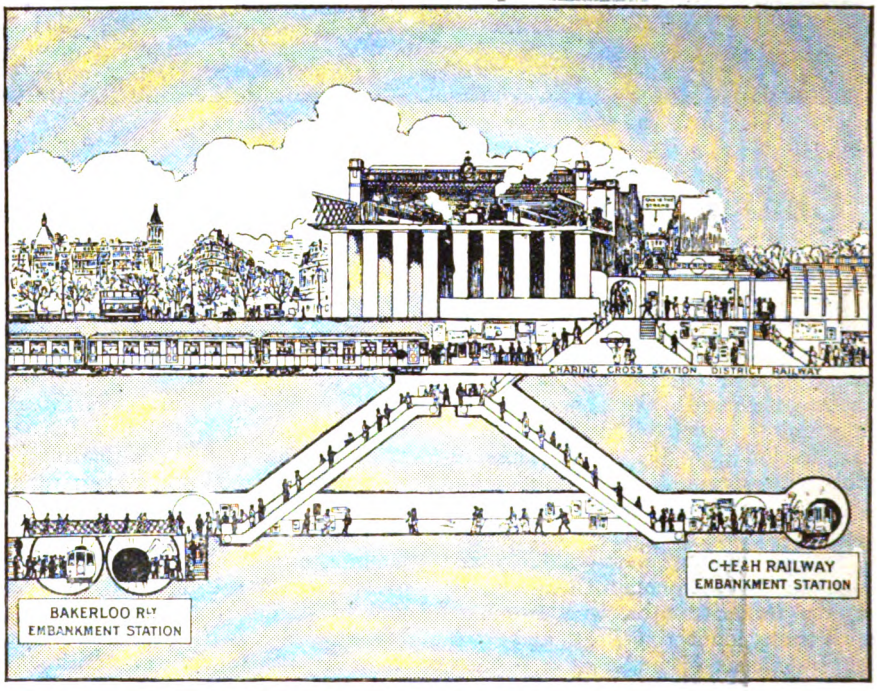
west, to the Bakerloo north or south, or north to the Hampstead line, and the various combinations create altogether 16 other standard routes. With the bifurcation of the Hampstead line to Highgate or Golders Green, and the enormous number of possible routes introduced by the comprehensive interchange and connection facilities given by the Underground systems, the importance of this traffic centre becomes almost inconceivable.

Work was commenced as regards the whole of the new undertaking in October, 1911. From the extremity of the south-bound Hampstead line at the top of Villiers Street, the new section passes under that thoroughfare to a point near York Terrace, where it deviates east, running beneath the Embankment Gardens from the Water Gate to Cleopatra's Needle, thence curving westward below the fringe of the river bed and returning north through the new station below the District Railway, extending north to south from Villiers Street to Charing Cross Pier, and so passes underneath Villiers Street again to join the north-bound line. The river section extends sixty-five yards from the Embankment wall, and the tunnel was bored at the rate of 47 ft. per week. Work on this portion began November 2nd, 1912, and was completed March 6th, 1913.

The new station is about 100 yds. east of the Bakerloo station, and the top of the tunnel is only 10 ft. below the foundations of the District Railway. There is only one platform, 350 ft. long. In order to build the new station the greater portion of the District station had to be under-pinned. This was done without interfering with the train service. As the South Eastern Company have powers to widen Hungerford Bridge, piers had to be built when constructing the new station to permit of this in the future. The weight of such a heavy structure was a very important factor, so far as the engineers were concerned.



SKETCH SHOWING STATIONS AND INTER-COMMUNICATION FACILITIES AT CHARING CROSS.

There are now 2,339 trains daily, on a normal service, serving the three underground stations at Charing Cross. Of these the District Railway provides 1,028, the Bakerloo 740, and the Hampstead (single track) 571. At busy periods the number in a single hour is 178, the three railways mentioned accounting for 86, 48 and 44 respectively. About a quarter of a million passengers pass through the station every week.

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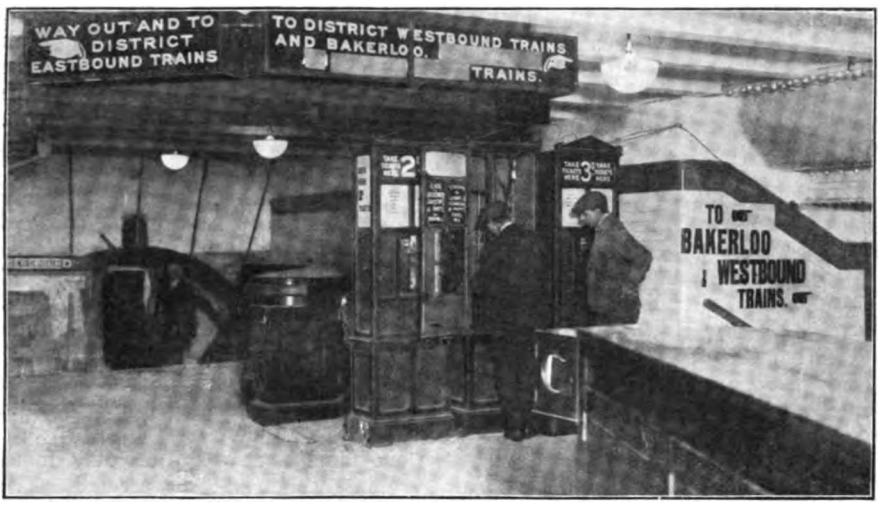

THE LOW LEVEL BOOKING HALL AT THE HEAD OF THE ESCALATORS, SHOWING AUTOMATIC TICKET MACHINES.

The new work has entailed an expenditure of about £200,000, but no increases in fares have been made, the London Electric Railway looking to increased traffic to recoup them.

The Hampstead Railway has the unique distinction of connecting with all five of the other lines of the Underground system—City and South London at Euston; Central London at Tottenham Court Road; Piccadilly Railway at Leicester Square; District and Bakerloo at Embankment. Considering only the three railways which meet at Charing Cross, every great railway terminus in London is served directly except London Bridge—even in that case the connection is an easy one—while the various intercommunication facilities meet almost every conceivable requirement, sometimes with alternative routes. As between the principal termini the gain is even greater, seeing that not only are convenient connections now made available, but also the journey times are expedited. For example, one can travel now from Euston to Waterloo or Victoria *vid* Charing Cross in from 10–12 min., a very considerable gain compared with times occupied when it was necessary to walk from one Charing Cross station to the other. Journeys such as those from Highgate or Golders Green to Mansion House are also very considerably improved.

On Friday, April 3rd, a party of press representatives were privileged to inspect the new work before it was opened for public traffic. This was followed by a luncheon at the Hotel Cecil, presided over by Mr. W. E. Mandelick (Secretary, Underground Electric Railways Company of London), in the absence of Mr. A. H. Stanley (Managing Director), through illness. Mr. Mandelick was supported by Mr. W. E. Blake (Superintendent of the Line, Metropolitan District Railway), Mr. J. P. Thomas (Superintendent of the Line, London Electric Railway), Mr. W. A. Agnew (Mechanical Engineer), and Mr. S. J. Webb (Passenger Agent, London Electric Railway).

Mr. W. E. Mandelick explained that the extension inspected was one of several in hand, and would have been opened earlier but for the unfortunate strike in the building industry. The new works were part of the policy of linking up the railways of the Combine, in which the public would also have the benefit of the facilities offered by the omnibus services. Against the capital outlay necessitated by all these works the Company naturally hoped to secure more passengers to carry. There were at present more trains run on their system than on any other railway in the world, and their policy was to take the best of care of the public interests, of their staff, and of their equipment. The Queen's Park extension would, he hoped, be the next important work to be completed, and this would add further to the public's transit facilities.

Mr. J. P. Thomas pointed out that the new arrangements connected with the loop embraced three railways in one, and might be regarded as a great engineering

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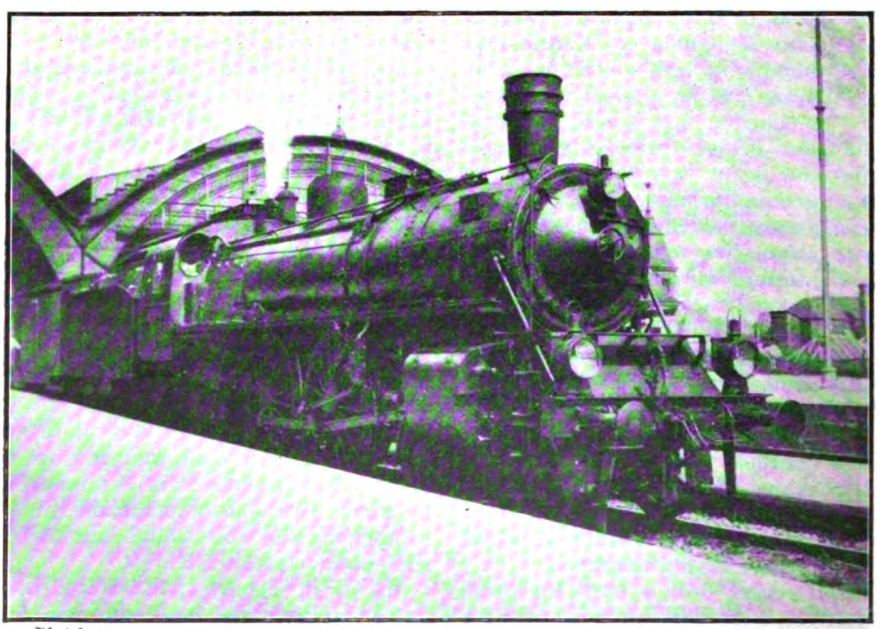
achievement, and reflected the highest credit on Mr. Dalrymple Hay, who designed the scheme. Of all his work for the Underground system none did him more credit than that which they had that day inspected. The Company had been testing the line for the last two days, and on Sunday would run the full service, ready for the first train for the public at 5.19 on Monday morning. With a break of only three-and-a-half hours the service would be continuous throughout the twenty-four hours, with forty-four trains an hour in the busy times of the day.

Among the other features of interest associated with the work may be mentioned the emergency exit from the lower stations, which is in the form of a circular stairway fixed in the original working shaft sunk by the contractors on the west-bound platform of the District station, below Hungerford Bridge. To maintain the atmosphere in the passages and stations below ground at an equable temperature, a special ventilating apparatus has been installed. Continuous supplies of fresh air, infused with a percentage of ozone and tempered to the requisite humidity, will be sent into the tunnels and circulated by the movements of passing trains. The new District station and the passages and staircases below are lined throughout with glazed tiles, in a pleasing colour scheme of white and green, and within and without the new Charing Cross (Embankment) station is typical of the many latter-day improvements made in underground transit facilities.

About three hundred men were employed during the two-and-a-half years occupied in construction. Over fifty thousand tons of earth have been excavated, and about four thousand tons of iron segments for lining the tunnel have been put into position, and something like a hundred thousand bolts used for fastening them together. The buildings of the District Railway station at Charing Cross have been demolished, and in their place a new station of a more convenient design is being erected. The new station is surmounted by a large glass dome and the Embankment and Villiers Street fronts are built of Portland stone. Additional entrance and exits have been made in Villiers Street and in a new passage on the east, through which the public have a right of way, and which supersedes the older passage on the west, which has been done away with in the alterations to the station.



Photo] [*W. Schauble.*

PRUSSIAN STATE RAILWAYS:

Four cylinder compound (Schmidt superheater) 4–4–2 locomotive at Coblentz.

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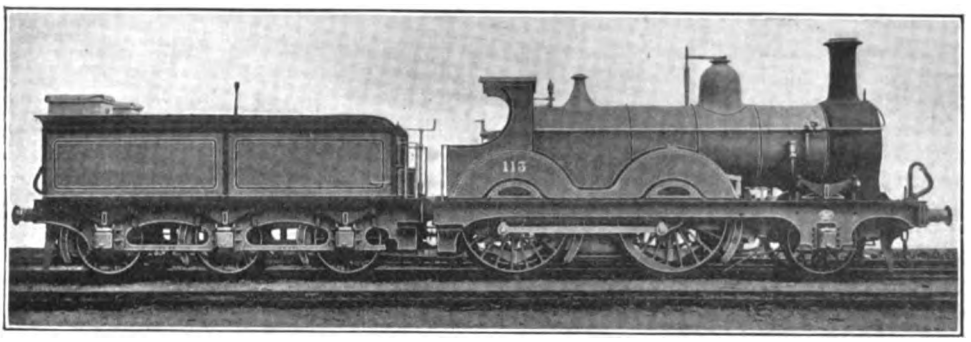

ONE OF THE LATER 2-4-0 ENGINES INTRODUCED BEFORE THE 4-4-0 AND 4-2-2 TYPES BECAME GENERAL ON THE MIDLAND RAILWAY.

Leaves from the Log of a Locomotive Engineer [No. XX.].

By ROBERT WEATHERBURN.

AFTER nearly three years' service at Liverpool I was informed in 1882 that I had been appointed as District Locomotive Superintendent at Leicester *vice* Mr. French. I was now on the main line system of the Midland Railway, and hampered no longer by the somewhat alien regulations of the Cheshire Lines Committee. Moreover many of the principal expresses were run from Leicester. As many of my readers are aware Leicester can boast of being one of the first three towns associated with railway enterprise, the Leicester and Swannington Railway coming after the Liverpool and Manchester was built by George Stephenson. This line (now linking up with Burton) forms an integral part of the Midland Railway and serves the South Leicestershire district, rich in coalfields, and prominent industries. It was promoted by John and Joseph Ellis. Mr. Edward Shipley Ellis, of whom I have not made previous mention, was, many years afterwards chairman of the Midland Railway. Indeed the Leicester and Swannington was considered to be the parent of the Midland Company.

The district, as also a few of the members of the staff, interested me greatly, as my father, who had been trained from his boyhood by George Stephenson, was selected by him, when only nineteen years old, to bring the first locomotive engine by canal to Leicester, in order to open the Leicester and Swannington Railway in the year 1837. It may be pardonable to say that the interest was the greater insomuch as I was born at Coalville (then the locomotive depôt) in the year 1840, and this line (now incorporated with the Midland Railway) being under my supervision in all relating to locomotive matters, I found myself brought into contact with names and places that I had not heard of or seen since I was a boy of eight years. I feel that no apology is required for the following little narrative which, although having no relation to the subject on hand, having occurred many years previously, tends to show the kindly relation existing between employers and employed at that period. I may preface it by saying that John and Joseph Ellis, the promoters of the Leicester and Swannington Railway, were Quakers, and like the majority of that class had strong prejudices against intoxicants.

One day in passing through the main street of Leicester in the company of George Stephenson, who was there on a visit, they, from a little distance, saw my father coming out of a doorway, apparently, of a public house. The two brothers were shocked at this evidence of early indulgence by so young a man, and drew Stephenson's attention to it. Calling my father to him, he forcibly expressed his annoyance. My father denied it. "But Mr. John Ellis saw thee, Robert, and that cannot be denied." "I did not, Mr. Stephenson," my father again replied, "I came out of the watchmaker's shop next door, where I had been to inquire the price of a watch." "That can easily be

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proved," said Mr. Ellis, still unconvinced, "for we will go back and inquire." They did so, and Mr. Ellis asked the watchmaker whether the young man had just left there. He was answered in the affirmative. "But, Robert, thou hast a watch already," said Stephenson.

My father pulled out an old Verge, and explained that, although it was a reliable one, he having heard so much of the new patent lever watch, one of which was in the window on view, thought of buying one, or exchanging his own with the addition of a monetary equivalent. Mr. Stephenson said little beyond that he was glad to know that he had proved his case, but on his next visit he put his hand on my father's shoulder and said, "Robert I've brought thee a little present, thou need'st not open it yet, take care of it." When my father opened the parcel it was a patent lever watch such as he never hoped to possess. It had struck a sympathetic chord in Stephenson's nature, for he himself was an admirer of the new patent lever. The action of Mr. Ellis must not be considered as unjustly interfering, for my father, at his own wish, had been transferred to the Company.

The drivers of the expresses at Leicester were amongst the oldest and best on the road, two of them even dating back to service on the old Leicester and Swannington Railway. My stay at Leicester was only for two years, but in order not to weary the reader I will curtail my story. Express drivers should, at all times, represent the cream of their class, and as a body they were such as any Company could be proud of; nevertheless, there were one or two exceptions who did not give that care and attention, so needful to uniform success. One such brought about one of the most extraordinary accidents I ever heard of.

The man in question was a great favourite with the through running guards, owing to his willingness to "make up time at a pinch." The train was the 2.40 a.m. *ex*-St. Pancras, commonly called the newspaper train. On the morning in question, in looking over the night foreman's report, I saw Tom's engine marked down as defective, and on enquiring was told that he had simply reported "connecting rod lost." I was incredulous, and still further annoyed when told that he neither knew how, nor where, he had lost it, and that little or no time had been lost. I immediately examined the engine, and found the connecting rod was missing, the axle crank damaged, and cylinder end cracked, with more or less damage to brake gear.

I sent for Tom, who showed anything but pleasure at being brought out of bed.

"No," he did not know how or when he had lost it.

"Did you examine cotters and set pins before leaving London?"

"Yes."

"Had you any trouble with it on the way?" "No."

"Did you look at it at Bedford?"

"Oh, I looked at it at Bedford, and it was all right then."

"Did you hear anything unusual in the way of a knock?" I questioned.

"No, the only thing I noticed was that something smelt hot. I went on the side of the footplate, but saw nothing."

"Where was that?"

"I think it was somewhere the other side of Little Bowden."

"Were you running faster than usual?" "About as usual."

"Who looked after the injectors?" "My mate, of course."

"Did the boiler prime at all?" "No."

I had before that satisfied myself that the boiler was clean, but I had already an idea of the cause, and in the absence of further information sent him home to rest. I then wired to Little Bowden stationmaster to ask the foreman ganger if anything had been found on the line? Then taking the diagram of that section of the line, I selected a clear-headed passed fireman who knew the road well, and provided him with a notebook and pencil, and an empty sandbag, and instructed him to take a slow train, then about to leave, proceed to the station beyond Little Bowden, walk thence to that station, and to note down carefully where he found the first evidence of broken brasses, assuring him that he would find such; and after, to proceed further, still noting other small finds until he came to the derelict connecting rod, and mark down on his diagram, and instruct the ganger, or stationmaster to forward to my address at Leicester.

The man returned after being away 4½ hours, with the bag full of pieces of big end brasses, and his notebook showed how exact my anticipations and surmises had been. He first noticed splashes and pieces of white metal on the ballast and sleepers, his next find was a piece of brass bearing, then three other pieces. Some distance intervened, then the connecting rod in bulk, fortunately lying between the rails. Thus I was enabled to

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build up a theory which was proved afterwards to be correct in every respect.

Perhaps my technical, or semi-technical, readers may find it of interest. My idea, after the interrogations mentioned, was that the injector had been kept on too long, thus flooding the boiler and causing a sudden priming of water into the cylinders; the result of this at high speed would cause the crown bearing of soft metal to be knocked off, water being practically incompressible. This, again, would cause the brasses to grip the journal of crank pin and become hot, the soft metal would then melt, and the additional half-an-inch of slogger with steam on the pistons would pound the brasses to breakage, as the heating of brasses to a high temperature causes a rapid fall in cohesion. These pieces would then fall out, and the big end, minus brasses, allowed the piston head to strike the end of the cylinder, causing fracture, and also the rupture of the strap at the weakest point. The rod, still coupled at the crosshead, then trailed on the sleepers, which were found damaged for some hundred yards, and at last wrenched off the retaining bolts that held it to the cross-head, when, freed of its last hold, it fell between the rails.

MR. S. W. JOHNSON.
Late Locomotive Superintendent, Midland Railway.

Immediately after sending the driver to rest, I had dispatched a caller-up for the fireman in order to see whether my hypothesis was correct as regards the injectors He was cautious, but finally admitted that he had left them on too long, flooding the boiler, and causing heavy priming. But the most remarkable part of the whole business remains to be told.

Little Bowden is some miles from Leicester, and how he had brought his train into that station can only be accounted for by the line being down hill and his running at excessive speed at the time it occurred. Some days after, a report was forwarded from the London and North Western, who, at that time, controlled the Market Harboro' Section—this was previous to the road being altered by the Midland who put in their own link—complaining of the excessive speed of a Midland train when passing their signal box. On examination of the dates, the driver was found to be Tom. This was a case of reckless running, and had the connecting rod fouled the rails, or the carriages, it would have caused a dreadful loss of life and property.

I will now trouble the reader with another accident, due to overcautiousness. In the year 1884, July 16th, the whole country was stunned by the dreadful accident which occurred on the Manchester, Sheffield, and Lincolnshire Railway at Penistone Junction, caused by the breakage of a crank axle. The nature of the fracture and the circumstances connected with it caused great consternation in the railway world, the result being that a special circular was issued on the Midland Railway that all crank axles should undergo a most careful examination for flaws or other defects, and such examinations should be more frequent than the regulation examinations hitherto imposed. Drivers were also

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specially instructed to examine before taking their engine out, and also before going off duty.

The result of the accident at Penistone was that nearly every locomotive superintendent got "crank axle" on the brain, as such breakages were more frequent than had been generally known. Imagine my consternation some few weeks after the disaster, when I was informed, early in the morning, that one of my engines working a late passenger train out of London had broken a crank axle in Elstree Tunnel and had frightened the nerve-stricken passengers into a state of collapse before they had got free of its murky and confined embrace.

I immediately went to the engine concerned, which was standing in a siding, and, seeing that it was not uncoupled (disconnected), enquired how it got home from Elstree, and was duly informed that the driver by the exercise of great care and circumspection had brought it home in steam. "But where is it broken?" I questioned, and was informed that the break was not yet located. It was certainly not broken in the cranks, nor between the eccentrics, as far as we could see; possibly it might be at one of the journals.

After stripping the big ends of the connecting rods and finding the cranks intact, I had the engine lifted at one end to enable the axle-box under-keeps to be dropped, thus enabling us to see the bearings; they were intact. I then sent for the driver, old Bob, one of the shrewdest and best men to handle a regulator in the country.

He remarked that it was a bad job, happening just now, but he had done the best he could. He was compelled to stop in the tunnel as the engine, after slipping badly, wrenched herself in such a way each time he gave her steam, that he dare not go any further. "But the worst feature," he said, "was that there was a press reporter in the train, and Mr. Clement Stretton's father, and that he was sure that it would be in all the newspapers."

"But where is the axle broken?" I asked.

"That I can't tell you, but I know it's broke, for every time I gave her steam she jerked all on one side."

"Well, Bob," I said, "there she is, go under and see for yourself."

After looking at the cranks and bearings, he still persisted in his assertion that the axle was broken somewhere.

I had a smart, level-headed foreman fitter standing by, and I told him to follow me into the office, where, away from observation, I instructed him to examine the sand-box valves carefully and bring me the obstruction, whatever it was, which he would find there. This was before steam sanders were introduced. In the meantime I took down driver Bob's report; whilst doing so the foreman fitter came in with a smile on his face and handed to me a small paper parcel, and on opening it I found a piece of dirty waste filled with sand, which I thrust into my pocket without comment.

Just at that time a telegram was brought from Mr. Johnson, express code, asking for full particulars, followed by others from the divisional superintendent. Yes! several of the London papers had given an alarming account of another railway disaster from defective cranks, thus adding to the public consternation.

I replied to the telegrams, assuring them that the axle was good, and in the meantime the engine had been lowered and put together; steam was then raised, and telling Bob to accompany me, I made a trial run down the line. After getting into swing, I said, "Now, Bob, how do you make it out that the axle is broken; where is that wrenching and knocking you spoke of?" He looked rather surprised, but answered, "You have not got the conditions yet. You have no load, no wet rails, the same as I had in the dripping tunnel."

I then told him to put the tender brake on equal to the load, which he did, and giving an extra head of steam produced a distressing slipping, but no wrench or twist, as Bob expected, followed. I then pulled out the paper containing the dirty piece of waste, and said, "There is your broken axle, Bob, that is what was preventing the left sand-box from working."

At the next station I was handed a telegram, forwarded from Leicester, informing me that I and the driver were to proceed to Derby at once. On our arrival Mr. Johnson, whose equanimity had received a severe shock, was much relieved when I showed him the piece of waste, and like a sound, practical man, he jumped to the right conclusion before I had explained matters. Meanwhile the driver stood anxiously awaiting judgment. On my privately assuring our chief that Bob was one of the best men on that or any other line, he gave him a little lecture in his best style, on the necessity of not allowing anxiety and care to get the better of his judgment.

I may here say that the peculiarity which

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Bob instanced undoubtedly occurred, and was caused by four trifling circumstances. Firstly, the engine driving axles had a certain amount of roll or knock in bearings and boxes. Secondly, the rails in tunnel being very greasy, caused the engine to slip badly. Thirdly, in order to check the slipping he applied sand which, owing to the box being choked, acted on the right only, transferring the whole of the tractive force or grip to the coupled wheels on the left side. This, at each application of steam, caused the sudden side wrench and knock. Fourthly, and lastly, Bob had acute "crank-axleitis" on the brain.

This was an exceptionally busy time, and the locomotive department, under the management of Mr. Johnson, was striving to meet the increased demands of the traffic officials for extra speed and weight. That gentleman had hitherto pinned his faith to four-wheeled coupled engines, whilst the Great Northern and Great Western Railways had for years been running fast expresses with single wheelers. Mr. Stroudley's single wheeler *Grosvenor*, which had competed at the Newark Brake Trials some few years previously, had, both in design and running, left a reputation behind it, and Mr. Billinton, Mr. Stroudley's former chief draughtsman, had for some time been installed in a similar capacity at Derby.

Indecision, for a time, marked their councils. When the decisive step was at last taken which led to the building of the single wheelers which for long after became so markedly a successful feature between London and Leicester and Nottingham, it was brought about as follows. Several small single-wheelers designed by Mr. Kirtley had been interdicted by circular instruction from running owing to the numerous delays caused by slipping.

One of these was stationed at Leicester, and was solely used for supplying steam to stationary engines at pumping stations whilst their boilers were undergoing examination or repairs. Being very short of power at this time, I never passed the proscribed and laid-up engine without feeling a strong desire to make use of it in some way or other.

At length the temptation was too great. I had the tarpaulin cover removed, and after examination of the tyres and springs, etc., gave instructions for the driving springs both inside and out to be strengthened by the addition of an extra plate; the sand-boxes, somewhat straggling, were brought nearer to the wheels, and pipes trained as closely to the tyres as possible to ensure the sand being delivered to a certainty without being blown away (steam sanders were not then in use.) The alterations were completed the day before Leicester Fair. On that day the traffic is always heavier than usual, despite which I determined to change engines and test the result on the South Leicester section. The engine did well.

I kept it at work for some months unknown, as I thought, to Mr. Johnson, and had nearly forgotten it, when I received a letter instructing me to take the engine in steam to Derby. Mr. Billinton met me on my arrival, and informed me privately that my action in violating circular instruction had been known to Mr. Johnson for some time, and that the working results had been carefully watched and considered successful, particularly the running up Barden Hill and the stopping and starting at difficult places; concluding by saying that Mr. Johnson had all but decided to adopt large single-wheelers for the Southern Division.

Being thus prepared beforehand, my interview was much facilitated. After an implied admonition *re* the "value" of "circular instructions," I had to recount all the alterations made, loads taken, etc. He then expressed as his opinion that I had loaded the axle to at least 17 tons. The engine was weighed, resulting in 17 tons 3 cwt. being registered. I had had no fear of the axle, the brand being Reay's, with no flaw or defect. It was decided, after some further discussion, to continue the engine in service. I strongly advised that a bogie should be part of the equipment of the contemplated engines, which was agreed to.

As stated, this was a busy and anxious time for all concerned in more ways than one. The automatic vacuum brake, now so efficient and reliable, was still far from being perfect, and formed a familiar object of attack for irresponsible and partisan critics. The rolling stock, carriages and wagons were rapidly undergoing alterations and replacement to fit them for the new order of things.

There still remained the *bête noir* of traders' wagons, the majority of which, being much below the standard, were a frequent cause of delay and breakdowns. I may here remark that the best organised and efficient breakdown staff that I have known was at Leicester at that time. All carefully selected men, each held to one particular duty, yet possessing the knowledge of each of the others when called to

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the most difficult tasks. Breakdowns being of frequent occurrence at that time, they combined energy and skill with enthusiasm that made the most arduous task a pleasure. With the after curtailment of traders' wagons and the exercise of rigid revision, breakdowns were reduced to half their number, and the advent of steam cranes, specially designed for the work, made them comparatively easy to deal with.

Another step of little less importance at this time was the introduction of heavy hydro-carbon oils in lieu of the animal and vegetable lubricants. Locomotive engineers of the present generation are happily entirely ignorant of the trouble formerly experienced in keeping the steam thoroughfare of the cylinders from being made up. It was an agreeable revelation to me when testing these oils at first to find that when carefully steam washed at high temperatures, they not only did equally as well unguentially as the most expensive rape oil, but also acted as a detergent of the incrustation, thus restoring the lost vigour of the engines. This was still further enhanced by the contemporary use of sight feed lubricators, an improved "Roscoe," which enabled the drivers to see and control the lubrication of cylinders, without running any risk as formerly was the case.

So far I have made occasional but inadequate references to Mr. S. W. Johnson, the Chief Mechanical Engineer of the Midland Railway Company, and for a term the President of the Institution of Mechanical Engineers. To one holding so important a position, and exercising so great an influence for over thirty years, something further is due both to the position and the man. As Chief Mechanical Engineer he supervised and controlled not only the locomotive department, but all steam engines and boilers, hydraulic installations, gas works, pumping water stations, and mains, etc.

Mr. Johnson served his apprenticeship at Leeds, in the firm of E. B. Wilson & Co., Railway Foundry, already mentioned, finishing his time in the drawing office under Mr. David Joy, inventor of Joy's motion. Thence he took service on the Great Northern Railway at Doncaster and Peterboro', "New England" as then called. After some time he joined the Manchester, Sheffield, and Lincolnshire Railway as Works Manager at Gorton, under Mr. C. Sacré, and subsequently secured the appointment of Locomotive Superintendent on the North British Railway. Thence he succeeded Mr. Sinclair on the Great Eastern at Stratford, and at the decease of Mr. Matthew Kirtley was selected as chief Locomotive Superintendent for the Midland Railway at Derby.

Few men if any had better opportunities of obtaining diversified experience, and few were capable of making better use of it when obtained. Without any pretensions to ingenuity, or even originality, he, nevertheless, had the ability to recognise and rate it at its true value. No man was a keener and better judge of men and methods. His varied experience gave him the opportunity of collecting ideas and opinions of great comparative and inferential value, and to this may be added great administrative capacity, tempered by more than ordinary caution and diplomacy. It was justly remarked by one who knew him from the commencement of his official career, and was highly qualified to judge, "that few if any engineers knew how to manage their affairs and directors as well, or with such finesse, as Mr. Johnson."

True to the motto "*Festina lente*," he rarely took the initiative in any new departure, but waited patiently for that stage of co-operation and development which ensured success before advocating or taking any decisive steps. This was particularly the case with the steam brakes, the steam and automatic vacuum brake combined, and steam sanders, and later the train-heating apparatus, each and all with many other things being introduced with success during his term of office. *

In connection with these improvements it would be unjust, if not unpardonable, to omit the name and services of Mr. Clayton, the Carriage and Wagon Superintendent of the Midland Railway, a man of considerable ingenuity, and accredited as being the author, amongst many other inventions, of the universal brake coupling now in almost general use, and approved by the Board of Trade and Clearing House. To this gentleman's endeavours more than that of any other man, is due the luxuriously appointed first-class and comfortable third-class carriages which are now a common feature of the principal English railways.

* In later years, also, Mr Johnson maintained his reputation as a capable locomotive engineer. The three cylinder compound express engines, developed during the last years of his administration, still justly maintain their unquestionably high repute in the equipment of the line.

(*To be continued*).

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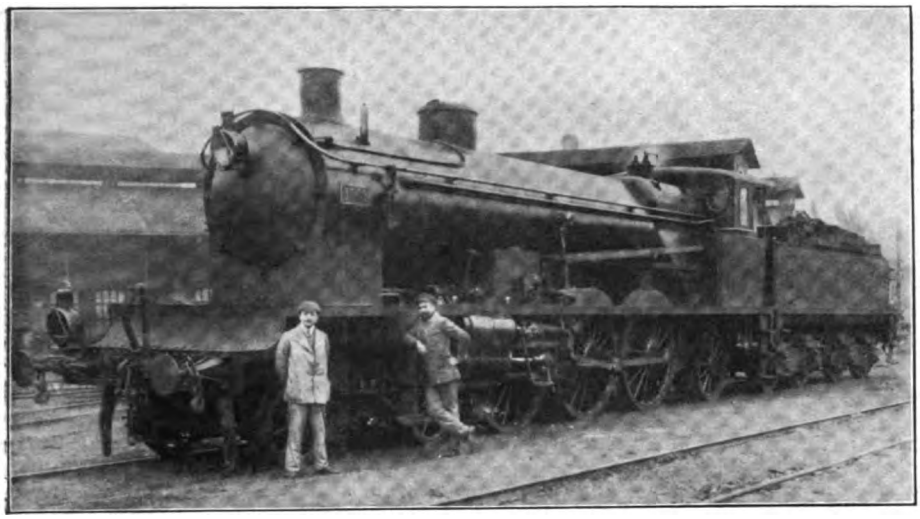

4–6–2 COMPOUND SUPERHEATER LOCOMOTIVE NO. 3003.
After completing a trip with the down "Sud" Express in charge of the Duke of Zaragoza as driver.

Notable Locomotives on the Northern Railway of Spain.

By THE DUKE OF ZARAGOZA.

[*The author of these notes is an authority upon locomotive matters, and is particularly well qualified to deal with his subject, in view of his close association with the railway concerned. Indeed, he is one of the very few titled gentlemen who are capable and qualified to drive express locomotives. He states that he drives one of the fast trains on the Northern Railway, at least once a week. The photograph of compound locomotive No.* 3003 *shows the author in front of the leading bogie wheels, his fireman standing near the outside cylinders. The Duke of Zaragoza is a Vice-President of the Railway Club, and the material used for this article has been supplied in that capacity.*—ED.]

BEFORE describing the new compound locomotives supplied by "La Societe Alsacienne de Constructions Mécaniques," from their Grafenstaden Works, to the Northern Railway of Spain, it will be convenient to review briefly the gradients of the main line between Madrid and the French frontier at Hendaye, two kilometres beyond Irun, the last Spanish station, *viâ* Avila or Segovia. The route by Villalba, Avila, Medina and Irun is 397 miles long, while the other is only 391 miles in length. Both are very hard and difficult.

The line starts from Madrid, 1,933 ft. above sea level, and rises continually until 4,526 ft. is reached at the summit in the station named La Cañada, 61 miles from Madrid. Thence it descends for 67 miles to Medina, the junction of the two routes. Medina is 2,166 ft. above the sea. The most severe gradient in this part of the line is near kilometre post 81, with an inclination of 1 in 47, but the average is only 1 in 60.

From Medina, the junction also for the Salamanca and Zamora lines, the track begins to ascend slowly to the first tunnel of the Brújula Pass, 25 kilometres beyond Burgos. This tunnel is 1,157 yds. long. The line then passes through seven tunnels as it descends to Miranda, the junction of the routes coming from Zaragoza and Bilbao.

A long climb through the pass is then involved to reach the summit tunnel at Otzaurte station (2,023 ft.). The length of this tunnel is 1,286 yds., and after traversing 31 other

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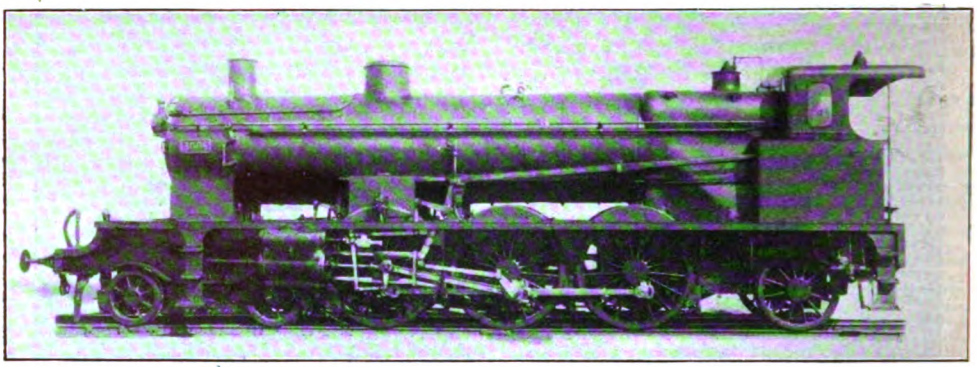


4-6-2 COMPOUND SUPERHEATER LOCOMOTIVE NO. 3005.

tunnels, on a gradient of 1 in 55, Irun is reached, the French frontier at Hendaye being a short distance beyond.

There are 58 tunnels between Madrid and Irun, *viâ* Avila; the longest is the Oazurza, 9,850 ft. in length. The line is also difficult, owing to the continual curves, many of them with a radius of 333 ft.

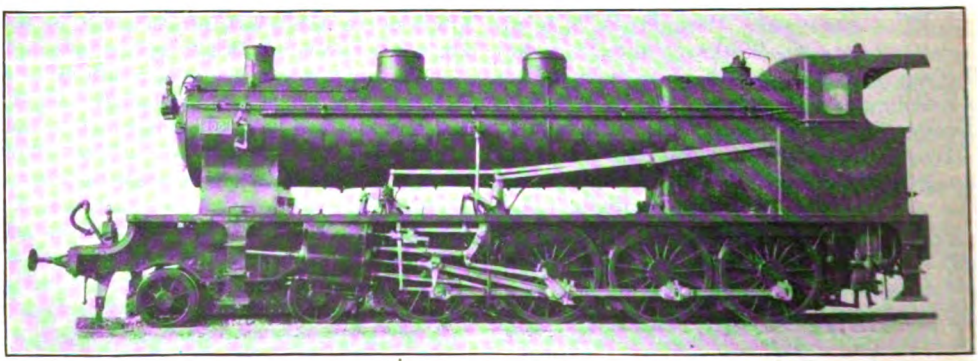
The route by Segovia is the same from Madrid to Villalba (23 miles), but the climb beyond the junction through the Guadarrama Pass is more severe, as the distance between Madrid and the tunnel summit is only 66 kilometres, the average gradient being 1 in 56 and the steepest 1 in 48. This tunnel, 2,380 metres long, is placed 1,299 metres above the sea. The line then descends to reach Segovia, an important and historic town. Passing this point, Medina is reached, rejoining the main line *viâ* Avila.

The total length of the Northern Railway is 2,298 miles. Vignoles rails are used, weighing 30 lbs. per foot. The only portions which are double track are those between Madrid and Villalba, 23 miles; between Medina and Miranda, 156 miles; and from Alsasua to Irun, 68 miles; total, 247 miles.

The more important trains on the main line are:

1. Express N.1 *viâ* Avila; leave Madrid at 9 p.m., arrive at Hendaye at 9.56 a.m.—15 hr. 13 min.
2. Sud-Express N.7 depart 8 p.m., arrive at Hendaye 9.56 a.m. *viâ* Avila—13 hr. 56 min.
3. Express N.9 *viâ* Segovia depart 9.15 a.m., reach Hendaye 11 p.m.—13 hr. 51 min.
4. Express N.2 *viâ* Avila; leave Irun 2.35 p.m., arrive Madrid 7 a.m.—16 hr. 25 min.
5. Sud-Express N.8; start from Irun 11.40 p.m., arrives 2.12 p.m. *viâ* Avila—14 hr. 32 min.
6. Express N.10 *viâ* Segovia; start from Irun 8.42 a.m., arrives at Madrid 10.58 p.m.—14 hr. 16 min.

During this year important acceleration will be introduced, and the following times will be in force from June 25th: Train N.1 will leave Madrid at 9.40 p.m., arrive Hendaye at 12.13 p.m., 14 hr. 45 min. Train N.7 will leave Madrid at 9.15 p.m., and arrive Hendaye at 9.56 a.m., 12 hr. 4 min. Train N.9 will leave Madrid at 8.45 a.m., and reach Hendaye at 8.55 p.m., 12 hr. 10 min. Train N.2 will leave Irun at 3.30 p.m.,



4-8-0 COMPOUND SUPERHEATER LOCOMOTIVE. No. 4001.

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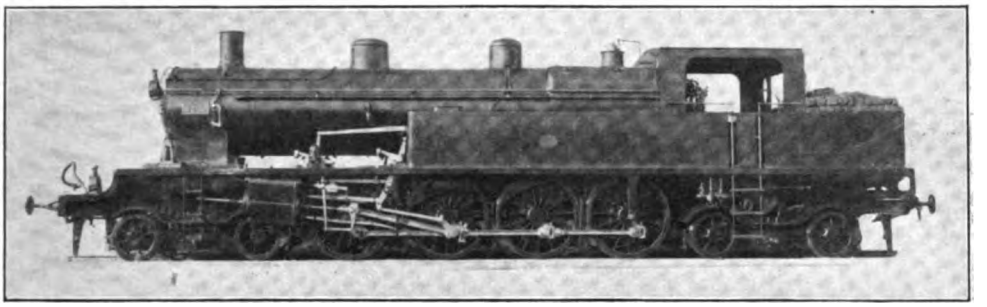

4–8–4 COMPOUND SUPERHEATER TANK ENGINE.

and arrive in Madrid at 7.3 a.m., 15 hr. 53 min. Train N.8 will leave Irun at 9.20, and arrive in Madrid at 10 a.m., 12 hr. 40 min. Train N.10 will leave Irun at 8.40, and reach Madrid at 9.45 p.m., 13 hr. 5 min.

Locomotives of three classes are now in service working these six principal trains: the 3000, 4000 and 4200 series, this last of the tank type. All are divided and balanced compounds with piston valves, Walschaert gear, Friedmann self-restarting injectors, vacuum brake with Dreadnought ejector, Hasler speed indicator, and Schmidt superheater.

The load of the trains hauled by the "Pacific" class on the sections with gradients of 1 in 200, is about 500 metric tons; over 1 in 100 gradients, 320 tons; and over 1 in 45 they can take 220 tons. The 4–8–0 and tank engines can keep time with 300 tons on the 1 in 45 gradients, 385 tons on 1 in 100, and 550 tons over 1 in 200.

LEADING DIMENSIONS OF THE LOCOMOTIVES ILLUSTRATED.

	4–6–2	4–8–0	4–8–4T
Type			
Cylinders, H.P. (in.)	14 $\frac{9}{16}$ in. × 24½ in.	15 in. × 24½ in.	15 in. × 24½ in.
,, L.P. (in.)	22 in. × 24½ in.	23 $\frac{11}{16}$ in. × 24½ in.	23 $\frac{11}{16}$ in. × 24½ in.
Coupled wheels	5 ft. 5½ in.	5 ft. 1 $\frac{9}{16}$ in.	5 ft. 1 $\frac{9}{16}$ in.
Leading Bogie wheels	2 ft. 9 $\frac{15}{16}$ in.	2 ft. 9 $\frac{15}{16}$ in.	2 ft. 9 $\frac{15}{16}$ in.
Trailing bogie wheels	4 ft.	—	2 ft. 9 $\frac{15}{16}$ in.
Steam pressure (lbs. per sq. in.)	227	227	227
Heating surface, tubes (sq. ft.)	1817·16	1817·16	1464
,, ,, firebox (sq. ft.)	161·46	161·46	159·6
,, ,, superheater (sq. ft.)	602·8	602·8	517·16
,, ,, total (sq. ft.)	2581·42	2581·42	2131·76
Grate area (sq. ft.)	43·05	43·05	32·3
Adhesion weight (tons)	47½	61	—
Engine weight in working order (tons)	76	78½	99
Water capacity (galls.)	4840	4840	2201
Coal capacity (tons)	7	7	—

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The Southwold Railway.

By H. L. HOPWOOD.

Photo] [*H. L. Hopwood.*

SOUTHWOLD STATION YARD.

THE Southwold Railway, connecting Halesworth, on the East Suffolk main line of the Great Eastern Railway, with the rising watering place of Southwold, is the outcome of a desire on the part of several prominent landowners in the neighbourhood to open up the district. The well-known Ipswich firm of engineers—Messrs. Ransome and Rapier—were greatly interested in the project, the late Mr. Rapier being the first Chairman of the Company. Incorporated July 24th, 1876, the railway was opened for traffic on September 24th, 1879, and can therefore claim to be one of the oldest of the narrow gauge lines in Great Britain.

Built to a gauge of 3 ft., the railway extends from Halesworth due east to Southwold, a distance of 8¾ miles. At Halesworth the station is alongside that of the Great Eastern Railway; suitable transhipping platforms being provided for the transfer of goods and coal traffic. There are three intermediate stations—Wenhaston, Blythburgh and Walberswick, and all are of the single platform type. Flat bottomed rails weighing 30 lbs. to the yard are used, resting on single or double sole plates, and fastened with fang bolts and dog spikes. The line is single, with a passing place at Blythburgh.

There are home and starting signals at each station operated by ground levers. The starting of a train from one station is notified by telephone to the next station, on receipt of which advice the signal at that station is lowered. The signals are of interest, being of an old pattern, the semaphores working in slots in the posts. Each post carries two arms placed opposite each other; the one for down trains and the other for up trains. The spectacles (which are lower down on the post than the semaphores) are fixed in line with one another, so that one lamp with glasses each side does duty for both sets of signal lights at night time. A simple locking apparatus ensures the points being correctly set before the signal can be lowered. One of these signals is clearly shown in the illustration of Southwold station yard.

There are no heavy engineering works met with *en route*, but just before Southwold is reached, the line crosses the River Blyth by a fine swing bridge of modern construction, and soon after this it passes through a picturesque cutting across Southwold Common. The steepest gradient is 1 in 53.

To diverge somewhat from our subject at this point, it may be said that a pleasant surprise awaits those who go to Southwold for the first time with the idea that this neighbourhood lacks scenic charm. Along the shore are miles of golden sands. At the back of the town is Southwold Common, which extends for some miles round, and is covered with gorse and bracken, reminding one somewhat of a miniature Dartmoor. Further inland, towards Blythburgh, are the Blythburgh Woods, through which the Southwold Railway winds in a picturesque manner.

Historically, too, the district is of great interest, and on all sides there are indications that a large population once inhabited the neighbourhood. Each of the villages passed by the railway possesses a magnificent church of considerable size, and these stand out prominently for miles round. They are fine examples, even for Suffolk, which is a county noted for its beautiful churches. Some four miles south of Southwold is the seaside village of Dunwich, which in the 12th Century was one of the greatest and most

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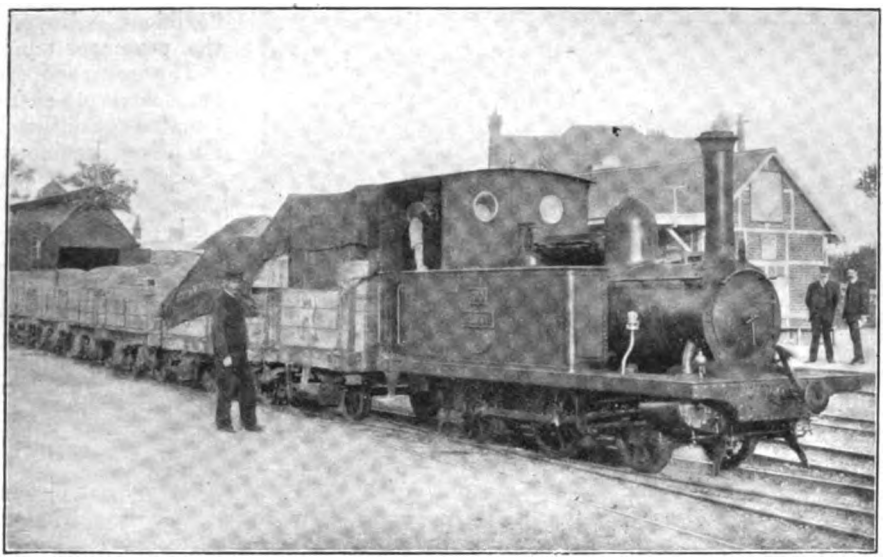

Photo.] [*Locomotive Publishing Co., Ltd.*

GOODS TRAIN DRAWN BY 2-4-0 ENGINE, NO. 3, *Blyth.*

prosperous of English ports, with a population of 40,000. The gradual encroachment of the sea for some hundreds of years, however, obliterated the town. On the edge of the cliff can still be seen the ruins of All Saints' Church, a 14th Century structure, which was last used for public worship in 1774, and was even at that time in a dangerous condition.

Returning now to the subject of our article, and dealing with the locomotives of the Southwold Railway: the original engines —three in number—came from the works of Sharp, Stewart and Co. in 1879, and were 2–4–0 side tanks with outside cylinders. It was soon found, however, that two engines only were all that were required to work the traffic at that time, so No. 1 was returned to the makers, and it was not until 1893 that traffic had increased sufficiently to justify an additional locomotive being supplied. This new engine was numbered 1, which number had been blank since the first engine had been sent back to the makers. It is similar to the others, except that it has the 2–4–2 wheel arrangement, and larger coal and water capacity, and thus weighs some two tons heavier.

The numbers, names and dates of these engines are as follows :—

No.	Name.	Makers' No.	Date built.	Date rebuilt.
1	*Southwold* ..	3913	1893	—
2	*Halesworth* ..	2849	1879	1901
3	*Blyth*	2850	1879	1900

The makers' number of the original No. 1 was 2848. The engines have cylinders 8 in. by 14 in., four-coupled wheels 2 ft. 6 in. in

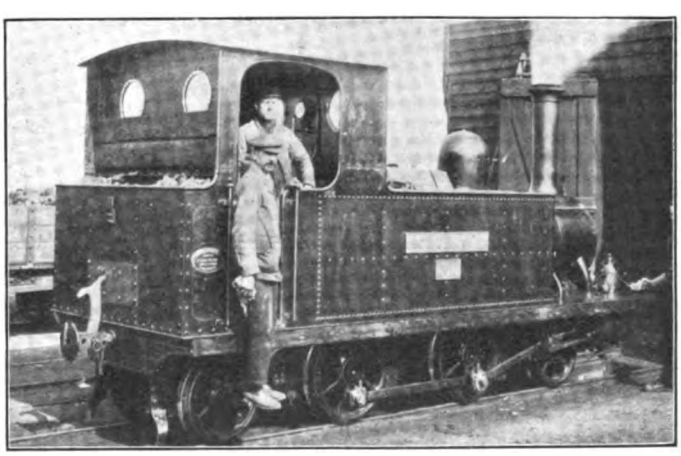

Photo. [*Locomotive Publishing Co., Ltd.*

2-4-2 LOCOMOTIVE NO. 1. *Southwold.*

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Photo.] [*H. L. Hopwood.*

SWING BRIDGE OVER RIVER BLYTH.

diameter and a heatingsurface of 189 sq. ft., the working pressure being 140 lbs. When first delivered they were painted green, but the present colouring is similar to that of the Great Eastern engines—blue, with red lining.

There are six passenger coaches, all six-wheeled, Cleminson's system of flexible wheelbase being adopted. They are entered by doors at each end, the seats being fixed down each side. The exteriors of the coaches are painted a red brown, with black lining and lettering. The wagon stock consists of 32 vehicles, 23 four-wheeled, and 9 six-wheeled, the latter having the Cleminson flexible wheelbase, as on the passenger stock.

The repair shops, engine and carriage sheds are situated at Southwold, but all heavy engine repairs are carried out either by the makers or at the Stratford Works of the Great Eastern Railway. The Locomotive Department is in charge of Mr. W. G. Jackson, who has been with the Company since its opening, and it is interesting to note that he was, previous to this, engaged on the pioneer railway in China—the Woosung Tramroad, opened in 1876.

Recently powers have been obtained to construct a branch line from the existing railway to the Southwold Harbour Quay, and this should be the means of providing additional traffic, and also prove a stimulus to the fishing industry at Southwold.

During the year 1913, the railway conveyed 108,677 passengers, 41,462 parcels, 7,334 tons of merchandise, and 6,474 tons of minerals.

Road Motor Vehicles in Railway Goods Service.

Photo] [*L.N.W.R.*

A LONDON AND NORTH WESTERN GOODS MOTOR LORRY AT HOLYWELL.

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The New Chief Engineer: London & South Western Ra lway.

Photo.] [*Elliott & Fry.*

Mr. Alfred W. Szlumper, M.Inst.C.E.

MR. ALFRED W. SZLUMPER, M.I.C.E., has been appointed to the position of Chief Engineer, London and South Western Railway, rendered vacant by the death of Mr. Jacomb-Hood. Mr. Szlumper's connection with the London and South Western Railway extends over a period of something like 30 years, during which time he has been concerned in virtually all the improvements in the neighbourhood of London. In the early part of his service he was engaged examining and calculating the strength of bridges in connection with the running of heavier engines, and he acted as Resident Engineer in charge of the extensive widening works between Waterloo and Barnes, including the reconstruction of several large bridges, and the widening from Hampton Court Junction to Woking, and from Winchfield to Basingstoke and Worting Junction. In 1897 he was appointed District Engineer in charge of the London District, one of the heaviest districts on any railway in the Kingdom, when the late Mr. Jacomb-Hood was transferred to Exeter as District Engineer. During Mr. Szlumper's tenure of office he has carried out many extensive and complicated works, including the Light Railway from Bentley to Bordon, the new "fly-under" line at Hampton Court Junction, the reconstruction of bridges over the Thames, etc. Mr. Szlumper is a distinguished member of the Institution of Civil Engineers, having presented many papers to that society, for which he has received awards, including the Telford Medal. The appointment is a very popular one with the staff.

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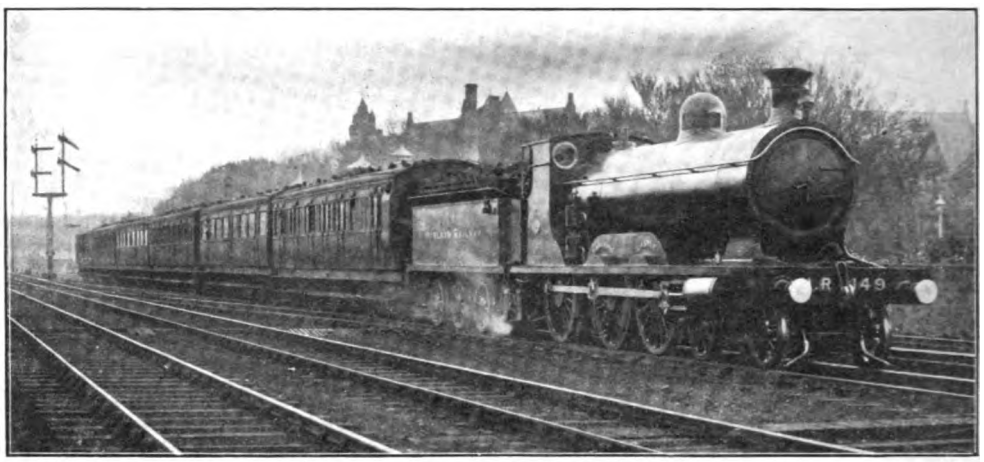

"STRATHPEFFER SPA" EXPRESS APPROACHING INVERNESS: HIGHLAND RAILWAY.

The Highland Railway and Strathpeffer Spa.

AWAY in the North of Scotland, yet only a few miles removed from Inverness, the "Capital of the Highlands," and within easy access in reasonable time from all parts of the United Kingdom, is Strathpeffer Spa, noted for its sulphur springs, for its ideal location, and for its convenience as a holiday and tourist centre, as well as for its attributes as a health and rest resort. Strathpeffer is simply the strath or valley of the "Peffery," a tiny stream which enters the sea at Dingwall. In this valley within recent years a pretty modern village has sprung up. Its situation is unique. Away to the north towers the great bulk of Ben Wyvis, rising to a height of 3,429 ft., and shutting off effectually the cold boreal blasts. On the other side the strath is bounded by the abruptly-rising, finely-wooded peak of Knockfarrel, much lower in elevation, but forming a picturesque feature in the landscape, and providing a capital climb for amateur "Alpinists."

The Highland Railway Company's hotel has already been described in these pages. It is beautifully situated on the hillside overlooking the town and adjacent to the Pump Room and spa buildings.

Strathpeffer is conveniently located for trips by rail in all directions, and as a centre for tours to the Hebrides and other parts of Northern Scotland. There are golf-courses, road and motor tours, and the like, to lend interest to a holiday. The Highland Railway has for some time past made special arrangements to facilitate and attract visitors, and even more is being done this year.

The best month to visit this famous Spa is June; as the full summer express train service on the Highland line does not begin until July, a new special express will be run as follows on every Tuesday in June in connection with the morning trains from Edinburgh, Glasgow, and Dundee:—

Edinburgh (Waverley) ..	dep.	10.5 a.m.
Glasgow Buchanan St.) ..	,,	10.0 ,,
Dundee (West)	,,	10.45 ,,
Perth	,,	11.45 ,,
Kingussie	arr.	1.36 p.m.
,, ...	dep.	1.46 ,,
Aviemore	,,	2.15 ,,
Dingwall	arr.	3.40 ,,
Strathpeffer Spa ..	,,	3.55 ,,

Through carriages will be provided from Edinburgh and Glasgow to Strathpeffer, and the train will be booked to run without stopping from Perth to Kingussie and from Aviemore to Dingwall.

During the summer season of 1914—July 1st to September 30th—a through sleeping car will be run from London (King's Cross) to Strathpeffer by the train which leaves at 7.55 p.m. every night except Saturday.

There will also be the accelerated service on Tuesdays only leaving Edinburgh (Waverley) at 10.5 a.m., Glasgow (Buchanan Street) at 10 a.m., Dundee (West) at 10.45 a.m., and Perth at 11.50 a.m., changing at Aviemore, whence a special service is given non-stop to Dingwall and Strathpeffer.

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PERTINENT PARAGRAPHS

The Earlier Holidays Movement.

THIS movement is finding substantial support in all parts of the country, and most of the railways are introducing their summer excursion arrangements earlier than usual. Several of the southern lines have for some time past brought their summer time-tables into force in June, leaving only a few special trains to be added in the height of the season; while there has been a general tendency to provide certain additional facilities in May and June even where the winter schedules are still retained as a basis. Therefore, until the earlier holiday movement becomes a really serious factor, such arrangements, with excursion and similar facilities rendered available, will suffice to meet requirements for the time being. It is for the public to show that further developments are required, and when this is done the railways will, of course, do their part. As it is, there is generous provision for the holiday-maker. Last month we referred to the new restaurant car services added on April 2nd by the Great Eastern Railway. Elsewhere particulars are given of important additional facilities provided on the Highland Railway. In the case of the Great Central Railway the 7.30 a.m. train from Leicester to Cleethorpes and the 7.20 a.m. from Cleethorpes to Leicester will run on Mondays, Thursdays and Saturdays during June. On Sundays the departures will be 7.35 a.m. Commencing July 1st, these trains will run daily. The full summer service will operate as from July 13th next. A neat leaflet has been issued by the Great Eastern Railway in connection with the earlier holidays movement; under the heading of "Timely Advice" readers are informed that "Spring and early Summer are glorious on the East Coast," concluding with the advice to "Come early."

* * *

Train Service Developments on the Caledonian Railway.

THE Caledonian Railway, in common with other companies in England and Scotland, are heartily in favour of the movement for earlier holidays, and in this repect are well able to accommodate large numbers of holiday makers in the early summer months, for the reason that their practice has been for several years, to commence a large number of their trains suitable for holiday traffic on the 1st of May. From that date, quite a number of important tours are in operation, such as the famous Trossachs and Loch Lomond, Loch Tay and Aberfeldy, Lanark and Falls of Clyde tours. By the end of May further additions to the tours are made, and in June the full arrangements will be in active operation.

The issue of tourist tickets between Scotland and England commences on 1st May, and in connection with the earlier holiday movement this year, for the first time, the weekly excursions between Scotland and England are to be commenced at the beginning of May. These excursions are given from Scotland to England every Thursday, and from England to Scotland every Friday, and extend until the end of September. Commencing also in May, a large number of local excursions in Scotland are given by the Caledonian Company, so that holiday-makers have every opportunity of visiting the many beauty spots in Scotland at a very cheap rate in the early summer months, and with much more comfort than at a later period of the year. An important development in the local Scotch excursion arrangements will be made this year by the issue of 8 and 16 day excursion tickets from Glasgow to the far North of Scotland—Aberdeen, Inverness, etc. The tickets will be issued on certain dates throughout the Summer, commencing in June, and as the company has long been pressed to give such facilities, they are expected to become very popular.

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Steamer and Residential Facilities.

As regards the steamer sailings on the Firth of Clyde from Wemyss Bay and Gourock, an augmented service was put on during April and is to be gradually increased, until by the middle of June the full steamer service will be in operation. This season it is intended to give additional steamer sailings on the Clyde Coast in connection with the Whitsuntide holidays.

As in former years, a feature of Caledonian summer train alterations will be the excellent service provided for residential purposes with the larger towns on the system. The majority of these services are, naturally, run to and from Glasgow and Edinburgh. The popular "Tinto" long distance express, serving the districts in the Upper Ward of Lanarkshire—Lanark, Thankerton, Symington, Biggar, Peebles, Crawford, and Moffat, is being maintained without any alteration, while to the Strathearn district of Perthshire the "Strathearn" express, from as far North as St. Fillans, and serving Crieff, Glencagles, and Stirling, still maintains its position in the time table. To the country districts within easy access of Glasgow, such as Strathaven, Busby and East Kilbride, Saltcoats and Ardrossan, Gourock and Wemyss Bay, and in the North, Stirling, Bridge of Allan, Dunblane, Doune, and Callander, there are convenient morning and evening residential services. The Stirling and Glasgow "Ben Lodi" residential express, which was

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commenced last year, leaving Buchanan St. for Stirling, Bridge of Allan, Dunblane, and Callander at 5.20 p.m., non-stop to Stirling, is again being run. Other residential services are given in the Dundee, Perth, and Aberdeen districts, and improvements are being made this year. In the Dundee and Perth district an improved service will be given from St. Fillans and Comrie, leaving St. Fillans at 8.7 a.m. and connecting at Crieff with the 8.49 a.m. express to Perth and Dundee, thus avoiding the wait at Crieff previously experienced by passengers from St. Fillans and Comrie.

A new fast service is being run from Dundee to Blairgowrie and Alyth at 5.20 p.m. this year, with a local train following at 5.50 p.m. as far as Newtyle. Apart from the residential services, a large number of improvements will be made in the train service generally as from 1st May, and the Saturday services will be largely augmented. On the Gourock, Greenock, and Wemyss Bay sections, commencing in June, twelve additional trains will be run in each direction, including trains run on Saturdays and Mondays only, and between Glasgow, Saltcoats and Ardrossan four additional trains will be available each way. Between Glasgow and Oban new trains will be run from Glasgow at 10.10 a.m. daily, and 2.5 p.m. on Saturdays, and from Oban to Glasgow and the South at 6.45 p.m. and from Callander to Glasgow at 5.35 p.m. Speaking generally, last year's summer train service will be maintained between Glasgow and the North. In the Edinburgh district the service on the Leith and Barnton branches will be supplemented by four new trains in each direction on Saturdays, and a new train either way on Sundays.

An important development this year, commencing in June, will be made by the provision of new Sunday trains between Glasgow (Central) and Edinburgh (Princes Street), serving Uddingston, Bellshill, Holytown, Shotts, Fauldhouse, Addiewell, and West Calder. Two trains will be run in each direction, leaving Glasgow (Central) at 11.10 a.m. and 8.15 p.m. and Edinburgh (Princes Street) at 9.0 a.m. and 6.10 p.m. Hitherto, there has been no train service on Sundays between the local districts mentioned and Glasgow and Edinburgh, but the Company have at length acquiesced in the general demand made by the public in these districts for such a service.

Another striking departure, already noted in the RAILWAY MAGAZINE, on the part of the Caledonian Railway is in the provision of Pullman Cars on all principal main line services. By arrangement with the Pullman Company 17 new cars are being provided, 4 Dining, 12 Buffet, and 1 Observation. The cars will be run on the more important express trains between Glasgow (Central) and Edinburgh (Princes Street): Glasgow (Buchanan St.) and Edinburgh (Princes Street) and Perth and Aberdeen; also between Glasgow (Buchanan Street) and Oban. A buffet Car will also be provided on the "Tinto" express between Glasgow (Central) and Moffat, and on the "Strathearn" express between Glasgow (Buchanan Street) and Crieff. The Observation Car will be run on the Callander and Oban Line.

There are no departures to record in the through West Coast services to and from England but mention must be made of the magnificent new sleeping saloons now running on the West Coast night trains in each direction. These were recently illustrated and described in the RAILWAY MAGAZINE.

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Railway Station Architecture.

IN a paper read before the Royal Institute of British Architects, Mr. Paul Waterhouse succinctly summarised the general impressions given by the principal railway stations in London. His comments were not always complimentary; but many of his remarks will be accepted by most people, including officers of railways whose termini do not accord with the ideas of architects and artists as to how a railway station should be designed. The great hall and the Doric portico at Euston naturally meet with approval, but Mr. Waterhouse considers the platforms and roofs behind as somewhat of an anti-climax; but as he acknowledged, "Euston is setting its house in order, and it is not fair to judge of the station by its present condition." St. Pancras met with almost unqualified appreciation. "Sir Gilbert Scott, in the full blast of Gothic energy, astonished the railway world with a quasi-mediæval external elevation, and the engineer, far from letting him down with disappointment, played up to him in an extraordinary manner. Instead of designing a commonplace truss, and decking it with scraps of ecclesiastical castings, he made the discovery that a giant pointed arch, with a concealed tie beneath the rails, was the form best suited to his needs. I have no hesitation in acknowledging that for grace, beauty of form, and sheer magic of fitness, the iron and glass roof of St. Pancras station gives one unqualified pleasure."

In regard to Marylebone, Mr. Waterhouse described it as "conceived and born under the ægis of that mischievous theory that, if only a street front of a station is masked by an ostentatious hotel, the station proper (or improper) can be left to the engineer." In the case of Paddington, Wyatt's "affectation of the Moorish mode was unhappy—but it was well intentioned. There is certainly grandeur in the big arcuated spans of the glass roofs, which are worlds removed from the timid and prosaic horizontality of our later efforts." King's Cross was described as a striking combination of vigour with debility. "In the sheer strength of direct purpose the engineer flung up those two Cyclopean arches, and in between them he set out to design an architectural climax which should unite and crown the whole design; the result was failure—he turned his drama into a farce. But why, I wonder, has King's Cross forgotten all this time that it has a forecourt—or at least a foreground. For many a year this rather shapeless but, I suppose, valuable site was dedicated to the display of rustic seats and summer-houses, the wares of some favoured merchant. At last, when tube railways came into use, we were made aware of the prospect that this fruitful field would give birth to a little pink stationette."

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Further Architectural Criticisms.

Cannon Street still maintains, when viewed from the river, "an almost picturesque suggestion of one of the minor entrances to the infernal

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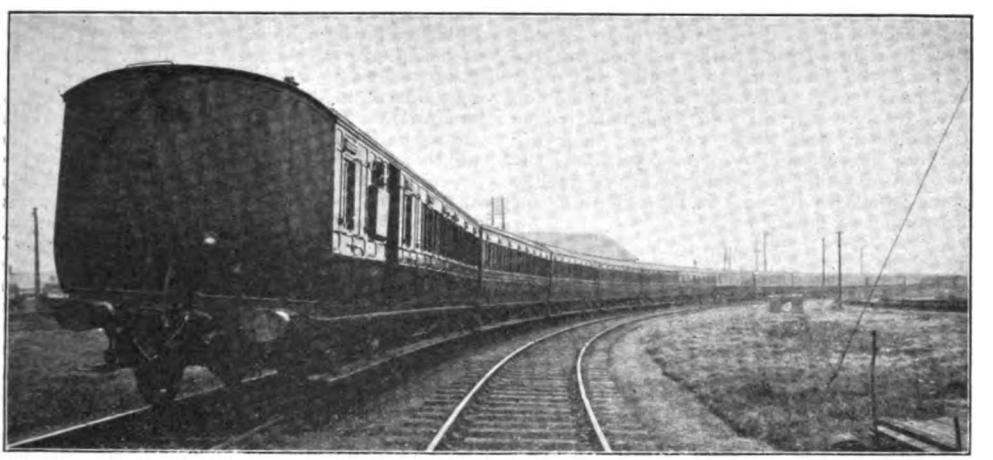
regions." Holborn Viaduct, while admiring the architecture of its hotel front, Mr. Waterhouse described as "conspicuously inglorious." Waterloo, in its early days was a very poor and mean affair, but recent years have shown a very hearty development, and the new station has about it many of the elements which one hopes to see in a station which is aware of the dignity due to its size. Victoria, again, is a notable instance of reconstruction. "The gentleman who designed the blank wall in Buckingham Palace Road did it right nobly. It is true that Victoria's iron roofs, though lofty are uninspired, but the really worst fault of the station is its inordinate size, or rather, its inordinate length." Liverpool Street is also "a monster," but it gets over its difficulties by lateral expansion, and here the man who happens to know at which side of the station it is best to enter may often save the precious minute necessary to his object. "The high and low-level entrances for passengers and the bridge connections from platform to platform are cleverly arranged in view of the fact that the great bulk of the passengers are luggageless suburbans. The station or, rather, stations at London Bridge are relics of the intermediate barbarism between the prophetic courage of Euston and St. Pancras and the mean modernism of St. Marylebone."

In connection with this paper Mr. Waterhouse said in reference to remarks concerning King's Cross Station, that he would guarantee that the offer of a prize of five guineas to architectural students under twenty-five would produce more than one good scheme for raising this elevation to nobility at a cost of £500. Mr. Waterhouse's challenge has been carried on by "The Architects' and Builders' Journal," which now offers a series of prizes to young architects who can suggest a £500 transformation. The promoters of the competition advise would-be competitors that the inclusion of the shelter in the competitive scheme of improvements has caused them to increase the assumed expenditure by £1,000—£500 being allowed for architectural improvements and £1,000 for the addition to and alteration of the present shelter.

New Rolling Stock for the London, Tilbury and Southend Section, Midland Railway.

Two new trains have recently been placed in service for the Southend express traffic, built under Mr. D. Bain's supervision at the Derby Carriage Works of the Midland Railway. In general features they correspond with present Midland standards for suburban traffic, or main line duties not calling for lavatory and corridor designs, and are in close coupled sets adapted to be joined with brake composites as required; the usual make-up for use at busy periods being thirteen of these vehicles, as long as platform No. 4 at Fenchurch Street will accommodate. With this composition the make-up is: Eight third-class, two first-class, one first and third composite, and two composite brakes. Each third-class carriage has eight compartments, ninety-six seats; the first-class vehicles have seven compartments and seat fifty-six passengers each; the composite has four first-class compartments (thirty-two seats), and three third-class (thirty-six seats); and the brake composites each accommodate sixty passengers in five compartments. The weights of these vehicles average 25 tons 8 cwt., and the full train, therefore, weighs empty 330 tons, no mean load for the 4–4–2 tank engines to deal with over the gradients of 1 in 110 included, and on the relatively difficult schedules in vogue. Length and width of the carriages over the bodies are 48 ft. and 9 ft. respectively, the first and third class seating six and four aside respectively. The first-class seats are divided by arm rests. The total length of the trains is 650 ft. exclusive of the engine. Outside panelling, painting and lining, roof designs and internal upholstery are in accord with the latest Midland methods. Steam-heating apparatus and electric lighting are provided, and the brake equipment is Westinghouse.



TRAIN OF THIRTEEN BOGIE COACHES BUILT AT DERBY FOR SERVICE ON THE LONDON TILBURY AND SOUTHEND SECTION OF THE MIDLAND RAILWAY.

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Irish Railway Development.

We are indebted to Mr. H. W. Lea for interesting particulars of development of several Irish railways. Referring to the record run with

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a special train on the Great Northern Railway, which was made on Thursday, February 26th, he quotes an even better one, with regard to load. This was made on March 14th, the occasion being the Ireland *v.* Wales Rugby International match at Belfast. A first and second class dining car special, with reserved accommodation for 400 passengers, was then run non-stop from Amiens St. to Balmoral, 110½ miles, in 121 minutes. Particulars of the special run referred to were unfortunately crowded out of our last issue owing to exceptional demands upon space, but may now be given. The special non-stop train was run from Belfast to Dublin with the Chairman of the White Star Steam Ship Company in connection with the launch of the *Brittanic*. The train was composed of two bogie vehicles (saloon and 3rd class van) and was drawn by one of the latest type (4–4–0) of express passenger superheated bogie engines, No. 174 *Carrantuohill* (Driver Bruce). A coloured plate of this engine was given with the RAILWAY MAGAZINE for September, 1913, and examples of work done by it were described in the same number. The distance, start to stop, is 112½ miles, which was covered in 116 minutes, an average speed of 58·19 miles per hour. Speed had to be reduced to 12 miles per hour on five sections of the line owing to relaying and other operations; to 20 miles per hour approaching Scarva (reverse curves) and Drogheda (curve and viaduct); and to 30 miles per hour approaching curves at Poyntzpass station; the train had also to negotiate a heavy incline varying from 1 in 100 to 1 in 110 extending for a distance of 8½ miles.

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Changes on the Midland Great Western Railway.

Mr. Lea continues in reference to the Midland Great Western Railway. He states that "nearly all the goods engines have now been painted black, and the change has spread to the passenger engines. *Mercuric*, of the 'Celtic' class, is the first of the big 4–4–0's in the new colour, plain black unlined, name and number plates painted red, and letters 'M.G.W.R.' on tender in gold. *Connemara*, of the second 4–4–0 class, is similarly painted, and *St. Patrick*, of the same class, has for some time been running in a half painted dull black state. I also observed two 2–4–0's in the new livery. Another of the 'Connemara' class is being built and is to be fitted with the Robinson superheater. There are eight of this class out at present:—*Connemara*, *Faugh-a-ballugh* (with oil tanks still fitted), *Shamrock*, *Emerald Isle*, *Croagh Patrick*, *St. Patrick* (the old *St. Patrick* No. 8 is now 8a at Broadstone), *Sylemore* and *Ballynahinch*. The abolition of the 2nd class, as from May 4th, is, in my opinion, a step in the right direction, though a bold one for this line. It will mean lighter but well-filled trains. For the past few years the 9.15 a.m., 10.30 a.m. in summer and 5 p.m. from Broadstone during the summer have been very heavy trains. The 5 p.m., especially throughout the summer months, was usually composed of 4 heavy bogie coaches with an average of 12 six-wheelers and 2 or 3 four-wheelers, and throughout the past couple of years I have repeatedly seen these two trains taken by one 'Celtic' with up to 20 vehicles in that proportion, or 24 with two engines, but the 1st and 2nd class vehicles were usually very sparsely filled: in fact, frequently empty, while the thirds were uncomfortably full. Latterly, as 2nd class vehicles are rapidly being converted, the trains are getting lighter, and empty vehicles rarer. English tourists will find a great change for the better in the 3rd class accommodation. The bogie thirds, electrically lighted, and with centre corridors (each compartment is shut off up to ceiling except for central doorway), are quite well cushioned and well got up. There are also some very good composite bogies, all above with lavatory accommodation; also some centre corridor six-wheelers on same lines as the bogie coaches. The old converted thirds (six-wheelers) are not quite so well cushioned, but there are a lot of second class coaches, converted by merely painting 3rd on them, which are really very comfortable to travel in. In fact, the Midland Great Western 3rd class accommodation is, I think, now the best instead of, as formerly, the worst in Ireland."

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The Penalty of Speeding-up.

RECENTLY there have been quite a number of letters in the newspapers setting forth various so-called grievances on the Underground and other railways where speeding-up and other methods of facilitating and accelerating traffic are in force. In most cases the writers endeavour to be humorous, but the phrase used by one of them—"pawky humour"—appears to be more directly applicable to his own remarks than to his subject-matter. The fact is, people who grumble most at the "sporting chances" associated with "non-stopping" trains on the District and some of the tubes are usually the first to complain that England is behind the times in respect of traffic facilities, apparently failing to see that this speeding-up is an almost inevitable and necessary corollary to development on progressive lines. Writers of this class are also notable for failing to observe that where overcrowding is really serious the conditions are also serious, and neither they nor the most energetic management can do the impossible and devise means to double the capacity of lines which are already included among the traffic wonders of the world, particularly when such doubling is only required for short periods daily and only then if delays or an emergency situation have accentuated the normal difficulties.

A point which has been raised is the supposed difficulty of knowing where a non-stop train will not call. As a rule there are quite sufficient indications about a train to serve reasonable requirements, and it may be pointed out that on the older steam lines people either refer to a time-table or enquire, while in both cases the station and train staffs are usually available to answer the queries of inexperienced travellers. Another difficulty which has arisen on the Underground lines is that of reserving the first class accommodation for passengers holding first class tickets. On the District the first class accommodation has been reduced so that it is sufficient but not excessive in view of the predominance of third class travel. Here again one may say that if a train is full the remedy is to wait for the next, and while one may sympathise with the third class passenger who is not allowed to travel first because there is no

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room in the third class coaches, one may also argue quite as legitimately that there is no reason why the first class passenger, who pays higher fares, should be crowded out of the special accommodation for which he has paid. The difficulty is a serious one; but it is well to consider both sides.

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Long Railway Tunnels.

In a recent issue of *The Engineer* particulars were given of the world's longest railway tunnels, including no fewer than 40 (with five others under construction) exceeding two miles in length. Twelve of these, with two others not yet completed, are for single lines only, while a few others consist of two single-track tunnels. The Swiss mountain frontier tunnels naturally head the list, the Simplon (12 miles 458 yds.) coming first, followed by the St. Gothard (9 miles 564 yds.), and the Lötschberg (9 miles 55 yds.). Fourth place is taken by the Mount Cenis tunnel (7 miles 1,730 yds.), fifth by the Arlberg (6 miles 404 yds.), Switzerland claims the Ricken (5 miles 610 yds.), Austria the Tauern (5 miles 546 yds.), and Italy the Ronco (5 miles 277 yds.) and Tenda (5 miles 56 yds.) tunnels, the Swiss tunnel known as Hauenstern Base (5 miles, under construction) completing those of five miles or more in length. Of the various tunnels in Europe set forth, frontiers account for four others, the British record, the Severn tunnel (4 miles 636 yds.—the longest sub-aqueous tunnel in the world) being described as England-Wales, followed by the France-Spain tunnels at Somport (4 miles 1,512 yds.) and Puymorens (3 miles 317 yds.) and the France-Switzerland tunnel at Mont D'Or (3 miles 1,395 yds.), all still under construction. Of the 37 tunnels completed in Europe, exceeding two miles in length, and attributing frontier tunnels to both countries concerned, Switzerland has 7, Italy (including Sicily and Corsica) has 10, France 7, Austria 5, Germany 1 (Kaiser Wilhelm, 2 miles 1,069 yds.), Norway 1 (Gravehals, 3 miles 516 yds.), and England and Wales the very presentable total of 9 (Severn, Totley, Standedge, Woodhead, Sodbury, Disley, Bramhope, Cowburn and Festiniog). Outside Europe a total of only three tunnels over two miles in length is acknowledged, the Hoosac tunnel (4 miles 685 yds.) in the United States, Khojak (2 miles 769 yds.) in Baluchistan, and Suram (2 miles 750 yds.) in the Caucasus. Several long tunnels are projected, including one on the Splugen Railway of 17 miles, the Rigoroso tunnel between Genoa and Tortona, 12¼ miles, and an 8-mile tunnel on the Mont Blanc Railway.

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A Census of Railway Speed.

Recently *The Times Engineering Supplement* gave a remarkable series of comparative tables, showing the improvement in railway speed for the 30 years between 1883 and 1913, the former figures being based largely upon details furnished by Mr. E. Foxwell to the Royal Statistical Society. The changes involved are curiously irregular, though a correction in a subsequent issue showed that an injustice had been done to the Great Eastern Railway, Cambridge being described as having the "unenviable distinction of being now no nearer the Metropolis in point of time than it was in 1883." It was later pointed out that the 12.20 p.m. train from St. Pancras to Cambridge is booked in 71 minutes, an improvement on the 76 minute schedule compared with the 75 minute train of 1883. Long distance journeys naturally show the greatest changes, the time from London to Aberdeen being reduced from 14 hr. 50 min. to 11 hr. 15 min., Carlisle from 7 hr. 15 min. to 5 hr. 50 min., Edinburgh from 9 hr. to 7 hr. 45 min., Glasgow from 10 hr. to 8 hr., Holyhead from 6 hr. 35 min. to 5 hr. 15 min., Newcastle from 6 hr. 7 min. to 5 hr. 13 min., Perth from 11 hr. 25 min. to 9 hr., Penzance from 8 hr. 55 min. to 6 hr. 35 min., Plymouth from 8 hr. to 4 hr. 7 min., Rhyl from 5 hr. 40 min. to 3 hr. 58 min., and Wick from 23 hr. 10 min. to 20 hr. 8 min. These figures—a selection only of those given—set forth only the times of the fastest service. As regards the principal towns within from 2 to 5 hours from London, the changes are equally notable, but to a lesser degree, and the following items may be selected, the 1883 and 1913 being given respectively in each instance: Bath, 2 hr. 13 min.—1 hr. 48 min.; Birmingham, 2 hr. 35 min.—2 hr.; Bradford, 4 hr. 15 min.—3 hr. 40 min.; Bristol, 2 hr. 36 min.—2 hr.; Bournemouth, 3 hr. 9 min.—2 hr.; Cardiff, 4 hr. 21 min.—2 hr. 50 min.; Cromer, 4 hr. 23 min.—2 hr. 55 min.; Exeter, 4 hr. 3 min. (London and South Western Railway)—3 hr. (Great Western Railway), 3 hr. 14 min. (London and South Western Railway); Leeds, 4 hrs.—3 hr. 25 min.; Liverpool, 4 hr. 30 min.—3 hr. 28 min.; Manchester, 4 hr. 30 min.—3 hr. 30 min.; Sheffield, 3 hr. 23 min.—2 hr. 58 min.; Torquay, 5 hr. 12 min.—3 hr. 38 min.; Yarmouth, 3 hr. 21 min.—2 hr. 30 min. It is worthy of note that in 1883 many of the fastest times were given by trains not conveying third class passengers, while in the 1913 figures only one instance requires this qualification, the 90 minute booking to Dover by the afternoon Continental service, which is necessarily first and second class only. It is also pointed out that in the interim certain faster schedules have been temporarily in force, as in the case of Scottish services following the 1895 "race," and Great Central trains to Manchester in 1904.

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Fastest and Longest Runs: 1883-1913.

Of 14 fastest start-to-stop runs recorded to the credit of 1883, only 6 attained an average of 50 miles an hour or more, the Manchester, Sheffield and Lincolnshire Railway heading the list with the 16 mile run between Manchester and Warrington in 18 minutes; followed by the Great Western between Paddington and Swindon in 87 minutes (77¼ miles); the Great Northern between Grantham and Doncaster in 58 minutes (50½ miles); the London and North Western between Northampton and Willesden in 70 minutes (60¼ miles); the Midland between Liverpool and Stockport in 45 minutes (37¾ miles); and the North Eastern between York and Darlington in 53 minutes (44¼ miles). In some respects the selection of runs involved appears a curious one in these days, especially as many of them remain nearly unaltered even now, the last affording the principal exception. In the same year there was only one non-stop run exceeding 100 miles, between Grantham and King's Cross, then booked in 2 hrs. 4 min.; but the Midland had

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Photo] [*H. Thompson.*

MOTOR TRAIN AT HOLLAND ARMS STATION.

a 127 min. booking between Leicester and St. Pancras (99¼ miles); the North British one of 2 hrs. 20 min. between Carlisle and Edinburgh (98¼ miles); and the London and North Western one of 117 minutes between Nuneaton and Willesden (91½ miles). It is unnecessary to refer to the comparative figures for 1913, which have already been set forth in these pages or will be well known to readers. Reference is, however, made to several very fast schedules which have been in force in recent years, but are now modified, such as the Perth–Forfar run in 32 minutes (32½ miles); Leamington to Ealing, 100¾ miles in 101 minutes; Peterborough to King's Cross in 78 minutes (76¼ miles); Appleby to Carlisle in 30 minutes (30¾ miles); Leicester to Hendon in 95 minutes (92 miles); Kettering to Bedford in 23 minutes (22¼ miles); Leicester to High Wycombe in 80 minutes (79¼ miles); Woodford to Leicester in 34 minutes (34 miles); Leicester to Marylebone in 105 minutes (103 miles); and Andover to Vauxhall in 68 minutes (65 miles).

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The Last of the Port Carlisle "Dandy."

On April the 4th, the "Dandy" which for so long worked traffic on the Port Carlisle branch of the North British Railway was withdrawn, a steam train, worked by 0-6-0 tank engine No. 22, taking its place, with a revised timetable on April 6th. In the RAILWAY MAGAZINE, August 1910, Mr. T. R. Perkins described the working on this section in detail, and other references have been made in these pages from time to time. There is now only one instance of horse-drawn traction on a railway in the United Kingdom, the Inchture branch of the Caledonian Railway. The Port Carlisle section of the North British Railway was opened in 1854, utilising the bed of a canal completed in 1793, but when the Drumburgh-Silloth line was brought into use in 1856, the earlier section became a branch. When first used steam traction was employed, but some years later, as traffic decreased, the horse-drawn "Dandy" was introduced, and has continued to be employed, covering upwards of about 50 years.

The Railways of Anglesey.

WE are indebted to the London and North Western Railway for the photograph reproduced on this page showing a motor train at Holland Arms station. The view was taken by Mr. H. Thompson on July 1st, 1908, the day of the opening of the line to Pentraeth, and gives a good idea of the motor train which has been formed by the adaptation of two old dining-cars. The entrance to one car is in the centre of the vehicle, and in the other at the end. The line to Amlwch is that curving away to the left, while the Red Wharf Bay branch bends to the right. In reference to Mr. Potter's article on this subject, published last month, it may be pointed out that there are golf links in the neighbourhood of Red Wharf Bay, but not near Llangefni. The fare for No. 1 Holiday Contract Ticket, first class, should be 29s., not 24s., as stated.

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Railway Pedantry.

UNDER this heading Mr. A. C. Benson, the well-known author, recently wrote to the editor of the *Daily Telegraph*, complaining that he was not permitted to use his Cambridge-London season ticket at Finsbury Park station, though it was available at King's Cross. He held a first-class season ticket from Cambridge to London on the Great Eastern Railway, available to Liverpool Street, Fenchurch Street, or St. Pancras, and also, by agreement between the companies, by the Great Northern Railway to King's Cross.

In the last few words he really explained the whole case—that by agreement he was permitted to travel to King's Cross, notwithstanding that he held a Great Eastern season ticket. But to be able to use his ticket at any intermediate Great Northern station is quite another matter, and naturally the Great Northern Company required to be paid for this journey. Mr. Benson was quite correct in stating that he could have come through to King's Cross, and then travelled back to Finsbury Park at a cost of a few pence. The fact that he did not do so shows that he did not pay attention to the

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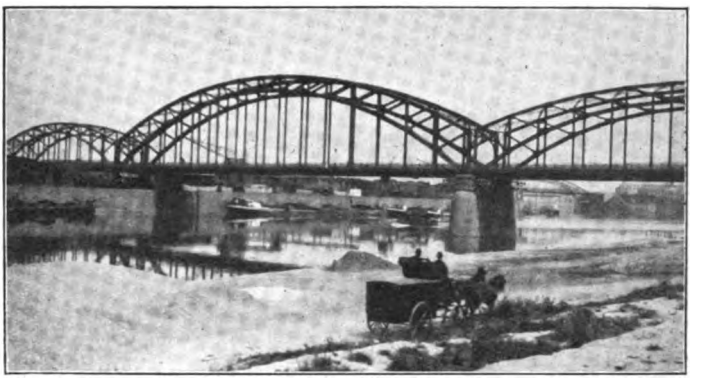
conditions upon which his ticket was issued. He may be correct in arguing that Finsbury Park is London, but one could easily extend this reasoning to cover Wood Green, or New Barnet and other suburban stations. Presumably Mr. Benson considers that because a Great Northern facility is offered with his Great Eastern season ticket he should also have all the conveniences pertaining to a Great Northern season ticket; but is he prepared to pay the cost of both? There are, in fact, numerous examples where, by agreement, tickets by one route are made available by another for over-all journeys, though not for intermediate traffic.



Photo] [*H. Kunkele.*

THE NEW RAILWAY BRIDGE AT FRANKFORT.

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Tail Lamps.

In reference to recent remarks under this heading, a North Eastern reader writes as follows: "Adverting to the paragraph on page 423 of the November Railway Magazine . . . I would beg to endorse your correspondent's remarks, especially with respect to the side lamps. With the introduction of gas and electricity for the lighting of coaching stock, the methods of illuminating tail and side lamps have undergone a radical change in recent years. Moreover, are not the side-lights also to serve as an indication to the fireman that the train is following complete, so that if, as your correspondent suggests, the side lights are on a brake van in the centre of the train, how can he know that all the vehicles are following? I noticed in one company's train recently the side lights were in the van ducket, and only showed red lights, so that there was no opportunity whatever for the enginemen to observe same. These lights, too, were very small, and at a short distance were indistinguishable. Some companies now have no side lamps, but two tail lamps. I do not know what the object is, but the old order of three red lamps on the rear of the last vehicle seems to be the better way of protecting the train." We would point out in reference to these remarks that with trains connected throughout by continuous brake fittings there is no necessity for giving the enginemen an indication that the whole of the train is following. Division would be followed by the stoppage of both portions. Consequently tail lamps are only required for other reasons on passenger trains, though on goods trains (not braked or piped throughout) side lamps are, of course, necessary.

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The New Railway Bridge at Frankfort.

Reference was made some time ago, in connection with a brief review of notable express runs on German railways, to the difficulties occasioned by the old right of the town of Offenbach "that every train must stop at this town." Mr. H. Künkele, a Frankfort reader, now writes, stating that a new bridge has been thrown over the river Main, avoiding entirely the Hessian territory, so that trains can run on the other side of the river past Offenbach directly to Hanau and thence to Berlin or Munich, eliminating in this way the useless stop at Offenbach. There is now a train running from Berlin to Frankfort in 7 hr. 8 min. (540·3 kilometres), stopping only at Halle, Erfurt, Bebra and Elm. Sixteen minutes are occupied at stations, so that the real average speeds work out at 49 miles per hour throughout. This summer the stop at Elm will also be eliminated, as a new tunnel between Schlüchtern and Fulda will be opened, avoiding Elm and the change of engines at this station. Next year a new avoiding line will also be opened, and thus there will be no stop at Bebra and no change of engine there. It is to be hoped that the whole distance between Berlin and Frankfort will then be covered at an average speed of 50 miles per hour, in spite of

Photo] [*H. Kunkele.*

ONE END OF THE NEW BRIDGE BETWEEN THE SOUTH AND EAST STATIONS AT FRANKFORT.

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the very difficult and hilly road between Erfurt and Gelnhausen. Mr. Künkele sends several photographs of the new bridge between Frankfort-South and Frankfort-East stations, and two of these are reproduced.

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"The Railway Times" and "The Railway Gazette."

WITH the issue dated March 28th, *The Railway Times* ceased to exist as a separate publication and became incorporated with *The Railway Gazette*. The change is instanced in a valedictory article as another illustration of the fact that the same causes which lead to the various amalgamations by which our great railway systems both at home and abroad have been built up, also have their effect on the railway press. *The Railway Times*, which has been published weekly since 1837, has had a long and honourable career; its volumes form a continuous history of British railway development during the past 77 years, particularly with reference to the financial side which in earlier times, when there were many hundreds of small companies instead of comparatively few great ones, was of more importance than it is at the present time when British railway securities are far less speculative stocks and rank only second to Government securities. We regret that one of our oldest established weekly contemporaries —incorporating as it did *Herapath's Railway Journal*, first issued in 1837—thus loses its identity; but in new hands its worthy traditions will be well maintained, and in due course developed.

* * *

Complicated Railway Journeys.

WRITING in reference to a "Pertinent Paragraph" under this heading, a Cambridge reader points out that the Great Eastern Railway boasts of at least two through trains in each direction which have five different engines on for each journey. These are certain trains from Yarmouth (Vauxhall) to Peterborough (Great Eastern) and *vice versa*. The westward journey is commenced by travelling from Yarmouth *viâ* Acle to Norwich (Thorpe), where another engine comes on at the rear of the train. The train then runs *viâ* Wymondham to Dereham, where engine No. 3 comes on at the (original) front of train and takes it *viâ* Swaffham to King's Lynn. Here another change of direction is made and a fourth engine takes the train *viâ* Wisbech to March, where engine No. 5 comes on at the other end and finishes the run to Peterborough. If these trains did not stop in passenger stations, our correspondent remarks that it would be possible to run over this route with only one change of direction, at King's Lynn, as there are loops and avoiding curves at Norwich (Wensum curve), Dereham and March. There is one other through service each way from Yarmouth to Peterborough daily by the Great Eastern route. The train from Yarmouth runs *viâ* Reedham, Norwich (Thorpe), Thetford, Ely curve, and March, thus only reversing once, while the train from Peterborough travels *viâ* March, Ely, Thetford, Norwich (Thorpe) and Acle, reversing twice (at Ely and Norwich). In the summer months a train runs through without reversing from Peterborough *viâ* Ely curve, Thetford, Wensum curve and Reedham to Yarmouth. Through coaches from Yarmouth to York and *vice versa* run on the trains *viâ* Lynn as far as March once a day, and the Great Central coach from Manchester to Yarmouth also goes this way to Yarmouth, but travels *viâ* Ely curve on the down journey. Another trip with two reverses in a short distance is that made by through Great Northern vehicles running to Mundesley-on-Sea, as these reverse at Melton Constable and Cromer (Beach), Midland and Great Northern Joint Railway.

* * *

Curiosities of Railway Practice.

IN a recent issue the question was raised "whether any ordinary trains are regularly hauled by two engines of different companies?" Apropos of this, a Birmingham reader writes that during the past summer it was quite the usual thing for the 12.3 p.m. express from Birmingham (Midland Railway) to leave that place hauled by a Somerset and Dorset large 4–4–0 express locomotive (usually No. 78) and piloted by a Midland 4–2–2 locomotive, while on the Somerset and Dorset Joint Railway Midland locomotives were very frequently piloted up the steep grades by a small Somerset and Dorset Joint engine. This is not done in the winter, and not invariably in the summer, so that it can hardly be called a regular practice. Our correspondent also remarks that for the past year a Somerset and Dorset Joint goods locomotive has worked regularly on a freight train to and from Birmingham, the engine usually being No. 75.

Certain other curious features of practice have also been brought under notice. One reader asks whether there is any instance, other than Euston Square (Metropolitan Railway), where it is necessary to cross a busy main road to pass from one platform to the other. Attention is also directed to the fact that, although neither junction nor terminal stations, Wembley and Pinner, London and North Western Railway, have six platforms. Bishopsgate, Great Eastern Railway, and Vauxhall, London and South Western Railway, are really in the same category (seven platforms in the latter case), but it is doubtful whether any other corresponding instances can be cited.

* * *

Railway Operation Under Difficulties.

WRITING from Palmyra, New Jersey, U.S.A., the Rev. T. J. Bensley, a reader of the RAILWAY MAGAZINE since No. 1, mentions some traffic incidents associated with a recent blizzard in his district. "The Pennsylvania Railroad had 21 trains snowed up on the New York Division between Bristol, Pa., and Trenton, N.J., a distance of about 10 miles. The Camden and Aboy Division of the P.R.R., on which Palmyra is situated, was badly crippled. The line was kept open between Burlington and Camden by means of a shuttle service yesterday, but to work this train, consisting of only three suburban cars of the new steel type, two engines were necessary. These were attached one at each end and consisted of a 4–2–2 type and a 4–4–0. To-day the lines are rapidly being cleared and the trains are more frequent, but owing to the wires being down, and the failure of many of the automatic semaphores, the authorities say that it will be some days before the usual schedule of trains can be restored. The Atlantic City express, which left New York on Monday morning, passed here at 3 p.m. this (Tuesday)

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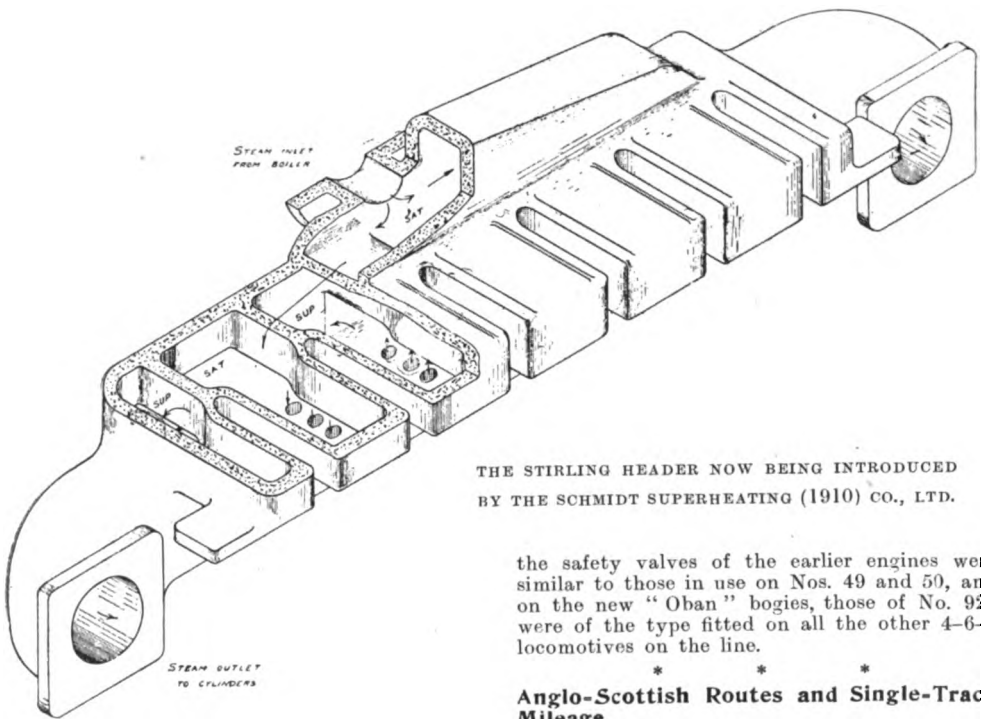
afternoon, having been snowbound at Redbank, N.J. Stoddart, the cricketer, was one of the passengers, and earned great praise for going through deep snow drifts to a near-by farm-house to obtain provisions for the famishing passengers in the snowed-in train."

* * *

The Stirling Superheater Header.

PARTICULARS were given in a recent issue of interesting developments in connection with Schmidt superheater equipment, and an illustration is now given of the Stirling header which is now being adopted in many cases. This corresponds with general practice except that insulating spaces or slots are formed between the saturated and superheated steam chambers, and these are utilised so that the bolts which hold in place the flanges to which the superheater elements is attached can be passed upward there-through, the retaining nuts being fitted above the header instead of below. The flanges are, therefore, fixed by a drawing-up action from above, and can be more conveniently manipulated than when they are below the header as usual.



THE STIRLING HEADER NOW BEING INTRODUCED BY THE SCHMIDT SUPERHEATING (1910) CO., LTD.

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Straight Railways.

IN reference to a recent paragraph under this heading, a reader in the Argentine Republic points out that on the Buenos Ayres and Pacific Railway the line is virtually straight for 686 kilometres, from Buenos Ayres to Villa Mercedes. Another reader cites the Vedia-McKenna section of the same railway, about 162 miles, as satisfying the conditions set forth. and as also notable in being almost level throughout. He sends a view showing what is said to be the largest bridge of signals in South America, a gantry in two spans with twelve dolls in three sets of four, each including three low ones with single arms and a higher one with stop and distant signals. This is located at Rufino, 249 miles from Buenos Ayres, and controls the connections of three branches with the main lines.

* * *

The McIntosh Locomotives of the Caledonian Railway.

A READER points out that in Mr. Bowman's article published in the March RAILWAY MAGAZINE five further engines of the 140 class, Nos. 923-927 should have been mentioned. These are virtually identical with the earlier engines of the No. 140 class. They were constructed during the years 1906 to 1908, and are employed with the similar engines all over the system. The only apparent external differences is that while the safety valves of the earlier engines were similar to those in use on Nos. 49 and 50, and on the new "Oban" bogies, those of No. 923 were of the type fitted on all the other 4–6–0 locomotives on the line.

* * *

Anglo-Scottish Routes and Single-Track Mileage.

IN reply to a reader, although the East Coast route does not quite achieve the record of the London and North Western and Caledonian route of providing double-line right through to Aberdeen, there is only a section of 10 miles 53 chains, from Inverkeilor to Hillside, which is still single track. Owing to its shortness this division does not introduce any difficulties, and it is extremely rarely that an important express is delayed by crossing trains.

* * *

A New Railway Wagon Sheet Fastener.

AS is well known, the present method of securing sheets over the goods in railway wagons is far from satisfactory, for not only is the expense of the usual tie ropes a considerable item per annum, but the claims which the railway companies have to meet for wetted goods due to breakage of the strings and the

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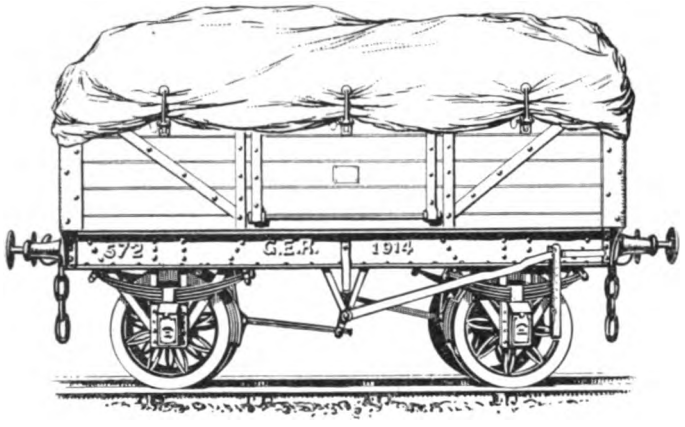

WAGON FITTED WITH MESSRS. JACKSON'S SHEET FASTENER.

damaged sheets blowing off amount to a large sum. The present antiquated method also involves a considerable waste of time in securing the sheets in place and the sheets are frequently torn and new eyelets required. To obviate the above objections and to produce a sheet fastener which shall be of a permanent character and not damage the sheets, Messrs. John and Richard Jackson, who have had considerable experience in the matter of the handling of goods on railways, have devised and patented a mechanical arrangement which is shown in appended illustrations. The base part *a* is attached to the wagon side, there being for example 8 or 10 fasteners on each wagon, and has brackets *b* thereon to receive a pin *c* which forms a fulcrum for a bell crank lever *d*,*d*^{1}, one end *d* of which carries a part *h* for clamping the sheet between itself and the wagon side, whilst the other part *d*^{1} bears against the plate spring *f* which holds the device in the service position. A locking pin *e* may be used to prevent accidental opening of the fastener, and a catch *e*^{1} may enter the pin end. Or a lock may be passed through the pin end. The device is exceedingly simple and effective and has given every satisfaction in the trials made of same on the London and North Western Railway.

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The Signalling of a Rapid-Transit Railway.

MR. H. G. BROWN'S paper on this subject, read before the members of the Institution of Electrical Engineers on Thursday, April 2nd, possesses special interest in that the author is so well qualified, as the Chief Engineer of the McKenzie, Holland and Westinghouse Power Signal Co., Ltd., to deal with his subject, and his remarks were based upon actual experience with the highly developed signalling in operation on most of the London underground lines. The paper dealt mainly with the relation between signal locations and headway, and with the importance of the overlap system; but included was a careful study of the effect, individual and cumulative, of signal checks upon the trains where very intense traffic is being conducted. The time interval between trains being the important factor, the length of sections is considered in terms of time instead of distance; and it is obvious that the section in which a station is included may, on account of the station stop, be a longer section in time than a section between stations that is many times its length lineally, because between stations it can be assumed that the train is travelling at its maximum speed. The time occupied in a station section is long because, in addition to the time required for the stop, the average speed when the train is moving is lower than it is between stations, as the station section includes both a deceleration and an acceleration. When providing signalling arrangements for a short train interval, it will be found that the station sections are the ones most difficult of arrangement. As the author points out, should a station stop be lengthened, it may first cause the following train to be checked, thus adding to the section time, as speed is lowered and an additional acceleration is then called for, and the delay is almost certain to become more serious at a busy period in that more passengers will have collected, its own station stop is lengthened, and the adverse influence is thus communicated to the next following train. If the delay is very slight it can be quickly compensated for, the resultant delay being less than the original delay; but a longer delay begins to have serious results, the effects being cumulative. The "reflex of the driver" is an interesting factor, though it is undoubtedly correct. This is due to the fact that a train approaching an adverse signal cannot be got into speed again at once, and two or three seconds may elapse after the signal is

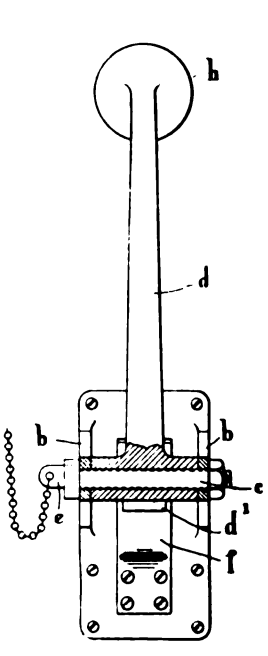

FIG. 1.

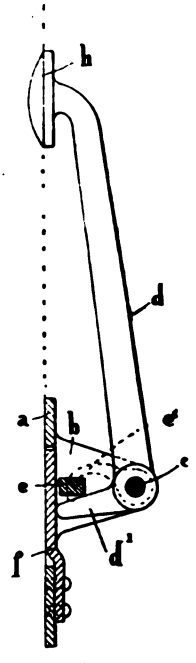

FIG. 2.

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cleared before the driver has taken action and realised the necessary acceleration.

The time required for the station stops is the most important of the various factors which influence the time interval, and while the value of this factor is mainly dependent on the amount of traffic at the station considered, it is greatly influenced by the physical arrangement of the station, and also by the efficiency of the train and platform staff.

* * *

The Speed-Control System.

If it is wished still further to increase the service, there is yet another arrangement of station signalling which is considered very satisfactory where it has been installed, and undoubtedly further reduces the time elapsing between the starting of the first train and the arrival of the next. With the speed-control system, as described by Mr. Brown, a following train would be stopped only a short distance in the rear of the train standing in the station, so that it has much less distance to travel than in the former case. The important function of the system is its control of the deceleration of the following train. This result is obtained by dividing the distance between the outer home signal and the point at which the train is intended to stop into a number of signal sections, a train stop and signal being provided at each point of sub-division. A timing apparatus is installed in connection with each signal and train stop, and is arranged so that the signal clears a predetermined number of seconds after the entrance of the train into its approach section. A train approaching an occupied station and decelerating properly therefore finds that each signal clears just before it is reached, but if it fails to decelerate at a sufficiently rapid rate the brakes are applied by the next train stop because it has travelled through the approach section in too short a time. The advisability of the use of the speed-control system as at present installed is open to argument, and the author expressed the opinion that in the majority of instances it is better to maintain at all times a definite minimum distance between trains.

* * *

Metropolitan Railway Improvements.

THE new express lines between Finchley Road and Harrow, in conjunction with the new station and general offices at Baker Street, may be considered the culmination of the progressive policy which has characterised development of the Metropolitan Railway for some years past. The new lines represent, probably, one of the most expensive pieces of surface railroad construction ever undertaken. When the work is concluded, the Metropolitan Railway will be in possession of four lines of electric railway track, one set for fast, the other for slow traffic, the double route enabling a constant service of fast trains to be maintained without any interference with the local traffic. The cost of construction, including the partial rebuilding of the railway viaduct at Kilburn, will work out at about £35,000 per mile. For some years, it has been the policy of the Metropolitan Railway Company to bring the City, and particularly the East and South-Eastern districts of London, into direct communication with the beautiful regions lying about Harrow, and on their Aylesbury and Uxbridge extensions. These, though geographically adjacent to London, have until lately been really remote to the City dweller, owing to the want of proper railway facilities.

The first step in providing these facilities was taken in 1908, when a through route was brought into operation by which passengers were enabled to travel from the City and East London to Harrow and the North through Baker Street, without a change. Owing, however, to the large number of stopping stations, it was found impossible to make the journey between Liverpool Street and Harrow in less than 45 minutes, and it was recognised that a service of fast trains, to be worked independently of the local traffic, was indispensable. The construction of another railway situated to a great extent on the Company's own territory, was therefore put into hand. Although this new railway line is not yet entirely completed, it has been found practicable, by means of a system of "cross-overs," to establish a preliminary express service, and non-stop trains are now running regularly between Harrow and Baker Street, the time of the journey being reduced from 31 to 17 minutes, rural country being reached from City centres in half an hour instead of 45 minutes as hitherto.

This development is expected to have an important effect in opening up a country which has long been secluded from the ordinary city resident and holiday maker. Scenery more charming cannot be found in any part of England: and to the builder as well as the excursionist, it is practically virgin territory. The solitary Chiltern Hills, standing at their base hundreds of feet above sea level, will henceforth be within easy reach of the Londoner, and with the railway facilities now available and pending, may be expected to become a favourite place of resort in the immediate future. Holiday trains from the City and East London, including New Cross, Rotherhithe, Wapping, Shadwell, etc., will be run straight through to the Chiltern Hills, and a new country abounding in natural and historic interest, thrown open to the residents of these densely populated districts. The antique character of the mediæval villages on the line, Chenies, Amersham, Great Missenden, Wendover, etc., has always been carefully preserved, and has remained unchanged during hundreds of years.

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A Notable Railway Exhibit.

THE Great Western Railway Exhibit at the Children's Welfare Exhibition at Olympia is one of the most remarkable in respect of completeness and realism. The whole of the Annexe is occupied, and the model steam railway is utilised to complete the *ensemble*, and may be considered to run from Paddington to Penzance. The background consists of a panorama of town, country, open sea and the Cornish Riviera, typical views being utilised as material; and in the foreground is a model lighthouse, a model pier, dancing and other greens, Cornish flowers, real sand from St. Ives, and a boat from the same place, with two local fishermen in their native attire in attendance. There is also a serpentine worker, plying his trade.

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In common with other companies the London and South Western Railway is introducing various excursion facilities earlier than usual, and in accordance with the policy adopted in recent years, the principal train services in advance of the usual summer arrangements will come into operation on June 7th. The chief alteration in the summer service affects the Continental traffic, it having been found practicable to so re-arrange both the night and day services to Havre, for Paris, etc., as to reduce the time by 45 minutes. Thus the boat train which last summer left Waterloo at 9.45 p.m. will leave at 10.30 p.m., the arrival at Havre and Paris being the same as last year. Similarly, the Saturday daylight service which last year left Waterloo at 8.45 a.m. will, this summer, leave at 9.30 a.m. and give arrivals at Havre, Trouville, Paris, etc., at the same times as last year. Extensive additions to the facilities affecting riverside resorts, particularly on Sundays, will be made in the May time-tables.

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For the enlargement and improvement of the New Street Station, Birmingham, a contract has been placed, and the scheme is a very extensive one, involving an expenditure of many thousands of pounds, and it will require nearly two years for completion So far as the platforms are concerned, the most important alterations will be made on the Stephenson Street side. At present beside the main platform, No. 1, for London trains there are four bays, two for local traffic for the north and two for the south. These are to be connected so as to form two new through lines with exceptionally long platforms. The present footbridge is to be closed to all but passengers by train, and a new thoroughfare will be made from Stephenson-place to Station-street for the use of the public. The new bridge will be approached from Stephenson-place by a subway. On the Stephenson Place side a large entrance hall with booking-office and other accommodation will be provided, and on either side of the hall will be staircases leading down to the platforms. Extensive alterations are also to be made to the Queen's Hotel, which will be greatly enlarged.

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The first four of a new series of "Prince of Wales" (4-6-0 superheater) passenger engines will shortly be running on the London and North Western Railway: Nos. 86 *Mark Twain*, 146 *Lewis Carroll*, 964 *Bret Harte*, and 985 *Sir W. S. Gilbert*. A new series of superheater goods engines are in course of construction. Nos. 896 *George Whale* and 1559 *Drake* ("Queen Mary" class), have been fitted with Schmidt superheaters. No. 2500 is the last of the 4 ft. 6 in. tanks to be altered for motor service, there being now no fewer than eighty engines of that type so equipped. No. 2028, 5 ft. 0-6-2 tank, has been similarly converted, and is at work in the London district. The work of extending the No. 9 erecting shop at Crewe Works is now well in hand, and it is hoped to commence work there shortly.

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The fact that the Stratford-upon-Avon and Midland Junction Railway serves not only Stratford-upon-Avon but also Sulgrave, the ancestral home of George Washington, renders it a valuable link in the touring and holiday system of the country; and many special arrangements are in force to meet the needs of visitors. Train services are conveniently arranged in connection with the Great Central Railway at Woodford and Hinton, the London and North Western at Blisworth, and the Midland at Broom Junction, so that it is a relatively easy journey from all directions to reach Stratford-upon-Avon station. For visitors to Sulgrave, conveyances meet the trains at Morton-Pinkney station on receipt of telegraphic advice, fare 1s. each provided there are at least three passengers. This year there will be special centenary celebrations at Sulgrave. Particulars can be had from Mr. A. E. Diggins, Traffic Manager, "S.M.J." Railway, Stratford-upon-Avon, as also of many special facilities for reaching Morton-Pinkney station and Stratford-upon-Avon. Another attractive arrangement offered by the "S.M.J." Railway is a rail and river trip to Cleeve every Thursday and Saturday from May 7th to July 11th (further arrangements after that date), and on Whit-Monday, June 1st. At fares ranging from 4s. 9d. in the case of Blisworth, to 2s. from Stratford-on-Avon, and 1s. 8d. from Binton, passengers are conveyed to Bidford-on-Avon and back, supplied with tea, and conveyed by steamer along the Avon to Cleeve and back. For the summer season, from July 13th the 4.30 p.m. train from Stratford-on-Avon to Woodford and Hinton and Blisworth will run to Woodford and Hinton only, and the 7.30 p.m. train from Stratford-on-Avon to Woodford and Hinton will be extended to Blisworth, thus giving a later connection between Stratford-on-Avon and Northampton. In addition to these alterations, the late trains on Saturdays only between Stratford-on-Avon and Broom Junction will be reinstated.

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In view of the growing importance of Whitstable as a seaside resort, especially that part of it known as Tankerton, the inadequacy of the present Whitstable Town station on the Kent Coast line, and to meet the needs of the traffic dealt with there, the Managing

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Committee have decided to construct a new station about one-third of a mile further eastward of the present one, close to the point where the Kent Coast line is crossed by the Canterbury and Whitstable Harbour line. This site affords an opportunity of making an intercommunication between the two lines, it being proposed to effect this by forming a short pathway leading to a halt to be provided on the Canterbury and Whitstable line. Residents at Tankerton will find themselves nearer to the new station than to the old one, whilst those who are more favoured by the station in its present position will need only to pass either along Cromwell Road South and its extension (to be called Railway Avenue) or Church Road, the former leading to the down side, and the latter to the up, although by means of the footbridge that will be provided foot passengers can reach either side. The new station is now in course of construction, and will consist of two platforms each 680 ft. long. It will be approached on the down side in two directions from Railway Avenue, and access to the up side of the station will be obtained also from two points in Church Road. Communication between the platforms will be provided by means of a footbridge, and another footbridge will give intercommunication between the station and the halt already mentioned. The accommodation to be provided will be of an ample and up-to-date description. A shrubbery is to be laid out by the Whitstable Urban District Council on the railway company's land on the down side of the railway adjacent to the approach road.

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THE Underground "Comic Map of London," recently issued as a poster, is one of the most striking efforts in the way of pictorial burlesque ever attempted. It takes the form of a large topographical map of the Metropolis, by Mr. MacDonald Gill, in the making of which the draughtsman has given unrestricted license to a very keen sense of humour. The idea is in every way a novel one, and full justice has been rendered to its possibilities, for probably no other single sheet of the same size has ever before been crowded with so many jokes, puns and witticisms as are here displayed. The principal thoroughfares and buildings, the parks, the river, and the Underground stations are shown, and the life of London in all its phases has been dealt with by the fun-creating pencil of the artist. From Shepherd's Bush to Whitechapel, from Hampstead to Clapham, every district has been made to contribute its share of parodied characteristics. The poster is sure to arouse more than ordinary attention wherever it is exhibited, for the more one studies it the more one discovers its seemingly inexhaustible sources of humour. A reproduction is given of another notable "Underground" poster, by Charles Crombie, in connection with the re-opening of the London Museum in its new quarters at Stafford House. It is adorned with a fine representation of a delicate piece of old Chelsea, in the actual colours. This is in more ways than one a happy selection, for not only does it draw attention to the beautiful works of the past that are preserved in the London Museum, but it also serves to remind the travelling public that Chelsea, which Underground passengers nowadays associate with the Great Power House, was in the past the place from which came some of

ONE OF THE FINEST POSTERS INCLUDED IN THE "UNDERGROUND ART GALLERY."

our choicest specimens of English ceramic art. Dover Street is the nearest Underground station to Stafford House.

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SEVERAL hundred boys between the ages of 14 and 18 years are employed by the Caledonian Railway in and around Glasgow, and for them it has been decided to start a Boy Scout Troop, with the necessary Club Rooms, &c. The directors kindly provided premises at 178, Eglinton Street, and they have now been open each evening of the week since October 9th last. A room has been fitted up as a Gymnasium for Boxing, Gymnastics, and Physical Drill. In addition, classes are held in Ambulance, Scoutcraft, Shorthand, Telegraphy, Signalling, Block Working, and Cookery, and a Swimming Class is also held on each Saturday night in the Gorbals Baths. Another room is set apart for reading and quiet indoor Games, with a Library attached. Competent Instructors who give their services gratuitously, have been appointed in all the subjects taught. Already over 150 boys are members and there is great keenness shewn in the movement. Most of the boys come from very poor surroundings and the Troop is therefore urgently in need of financial assistance. The initial expenses have been considerable, and though the boys each subscribe a penny a week this will not even cover the annual Club Room expenses. It is necessary

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to assist in providing the boys with uniforms, and there is the camp equipment to obtain for the summer months when it is hoped to hold several camps. The whole idea of the movement is to give the boys a chance of both learning discipline and character training, and also of obtaining a knowledge of subjects which will prove helpful to them through life. RAILWAY MAGAZINE readers who care to give the association financial encouragement are invited to send subscriptions to Mr. M. S. Speir, Hon. Secretary and Treasurer, 302, Buchanan Street, Glasgow.

* * *

MR. JOHN MAITLAND Station Superintendent at Edinburgh (Waverley,) since June, 1908, has retired under the age limit, completing a long and meritorious record of service with the North British Railway. He is a native of Glasgow. In December, 1863, he joined the staff of the Audit Office of the Edinburgh and Glasgow Railway as an apprentice clerk. When that railway was amalgamated with the North British in 1865, he was sent to the Lost Property Office, Glasgow, having by that time also had a short period of training as junior clerk in the locomotive department at Cowlairs. Prior to being appointed stationmaster at Dalkeith in April, 1879, he had served successively in the capacity of booking clerk at Haymarket, night telegraph clerk at Edinburgh (Waverley), clerk in the general goods manager's office at Glasgow, clerk at Dundee for three years, and relief agent for four years, during which latter period he had many important temporary duties to perform at busy stations and junctions and also in the head and district offices. On the agency at Grangemouth becoming vacant in 1889, he was transferred there, and seven years later he was transferred to a still higher post of much the same order at South Leith.

At both places he received handsome testimonials from passengers and traders, and at Leith he took a leading part in promoting ambulance work in which he had always taken special interest. In June, 1908, at the age of 59, he returned to the passenger department, this time to take over the highest graded stationmastership on the North British line at Edinburgh (Waverley). Mr. Maitland's portrait appeared in the RAILWAY MAGAZINE, April, 1912.

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As already mentioned, a loop is being constructed at Margate West to connect the Margate Sands section of the South Eastern and Chatham Railway with the Faversham main line, the intention being to concentrate the passenger traffic to and from Margate at Margate West station and close Margate Sands station to all but goods traffic. The operation will be a costly one, for it not only necessitates the reconstruction of the southern or up side of Margate West station, but also the formation of the new loop referred to. A portion of the new work, which included the construction of an island platform and the provision of siding accommodation for the stabling of empty trains, was completed in time to be brought into use for the summer traffic of last year. Although a good deal has been done towards the realisation of the scheme, much still remains to be undertaken. It is intended to provide five platforms in all, four being through and one a bay platform, each of ample length to deal with the traffic contemplated. A subway 20 ft. in width divided by fencing is being constructed between the platforms, and this will be used for the transference of luggage from one to the other, as well as for passengers' use. The accommodation to be furnished in the way of waiting-rooms, lavatories, refreshment rooms, etc., will be of an adequate character, and the provision for cabs approaching and leaving the station will be considerably improved. A turntable 60 ft. in diameter is to be installed for enabling engines of trains terminating their journey at Margate to be turned for their return trip.

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THE twentieth annual competition for the North British Railway Ambulance Challenge Cup took place in Leith Central station on April 4th. The competition, which was conducted under the auspices of the St. Andrew's Ambulance Association, consisted of a practical demonstration of treating the injured, and of the transport of the injured, as well as an oral examination. Ten minutes were allowed for examination in each of the three departments. The examiners were Drs. Malcolmson and Melville, Edinburgh, and Dr. Erskine, Glasgow. The following 21 teams took part:—Burntisland, Carlisle, Cowlairs Station, Cowlairs Works, Dunbar, Dunbar District, Dunfermline, Helensburgh, Helensburgh District, Ladybank, Leith Central, Leith District, Methil, Queen Street Goods, Queen Street Passenger, St. Margarets, Tay Bridge, Thornton, Thornton District, Waverley District, and Waverley Station. The arrangements in connection with the competition were carried through by Lieut. Col. H. J. Barnes of the St. Andrew's Ambulance Association and Mr. Murray of the General Manager's Office, North British Railway Company. The cup is held by the winning team for a year, and each of the members receive a gold medal. The result of the competition placed the Queen Street Passenger team first, Waverley Station coming second, Thornton Station third, and Leith District fourth.

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MR. CUMBERLAND LOWNDES, Chief Outdoor Goods Manager, London and North Western Railway, has been appointed Manager to the Port of London Authority. He is a son of Robert Lowndes, of Tarvin, Cheshire, and was born in 1868. Educated at the Merchant Taylors' School, he entered the London and North Western Railway's service in 1883, and was engaged in various station offices, goods and coaching from 1883 to 1887. Subsequently engaged with District Superintendent's office at Euston from 1887–1891, he served in the Superintendent of the Line's department from 1891 to 1894, and was in the Outdoor Department of the same division 1894 to 1898. In the latter year he was made Assistant Superintendent of the Northern Division; in 1903 became District Superintendent, Central Division; taking a similar position for the North Eastern Division in 1908. In the following year he was appointed District Superintendent for the Southern Division. In 1910 he became Assistant to the Superintendent of the Line; Outdoor Goods Manager, Northern Section, 1911; Outdoor Goods Manager, Southern Division, 1913;

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and later in the same year, Chief Outdoor Goods Manager, on the appointment of Mr. F. T. Kinsman to succeed the late Mr. C. E. Grasemann as Chief Goods Manager.

* * *

MR. WALTER H. HYDE retired from the position of General Manager on April 4th, Mr. H. W. Thornton's appointment as his successor dating from April 6th. A few days before, Mr. Hyde was entertained to dinner by the principal and district officers of the Great Eastern Railway Company. On behalf of his colleagues, Mr. Busk, Continental Traffic Manager, presented Mr. Hyde with a gold watch, a bronze statuette on a pedestal, a set of Sevres vases, and a handsome diamond pendant for Mrs. Hyde. In making the presentation Mr. Busk referred to the pleasant relations that had always existed between Mr. Hyde and the officers of the Com pany, and expressed the hope that the rest he was about to take would restore him to complete health. Mr. Hyde, in thanking the officers, said that it was not possible for anyone to have more willing assistance and co-operation than they had always afforded him, and one of his reasons for choosing a watch was that he would look at it more frequently than at anything else, and it would, therefore, be a continual reminder of the pleasant hours he had spent in their company. A further presentation was made to Mr. Hyde by the members of his office staff in the shape of a silver rose bowl.

* * *

FOUR notable posters have been issued by the Great Eastern Railway. The first shows the now characteristic longshoreman leaning against a boat at the water's edge, giving the invitation to "Come Early to the East Coast." The second is characterised by a dense blue ground, utilised to suggest the blue jersey of a fisherman, a shore view forming the base of the poster. Here the injunction to "Come Early" is combined with the intimation that "The East Coast is unsurpassed in Spring and Early Summer." Nos. 3 and 4 are large posters, the first being a new version of "The Charm of Poppyland," by Hayward Young, the foreground showing a field ablaze with gorgeous poppies, blending with a really splendid view of the Norfolk cliffs, with a tiny hamlet in a gap, a village in the distance, and a fine sand and sea scene as background. For artistic excellence this is one of the best posters of its kind, but as a half-tone reproduction loses all the benefit of the beautiful colour effects, we must refer our readers to the original. The last of the four depicts a young lady shaded by a scarlet parasol and with a book before her, lying on the grass at the edge of a cliff "'Neath the blue of the summer sky."

AN INVITATION FROM THE GREAT EASTERN RAILWAY.

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MR. G. H. PEARSON, Assistant Manager, Carriage, Wagon and Timber departments, Great Western Railway, since 1905, has been appointed Assistant Locomotive, Carriage and Wagon Superintendent, South Eastern and Chatham Railway. At the conclusion of his apprenticeship (during which he was given special leave of absence to enter upon a course of study at the University College, London) he entered the works drawing office, where he was engaged upon work in connection with hydraulic machinery, steam engine indicating, diagrams of locomotive and train resistance, and other general work. In 1898 he was transferred to the principal drawing office, where he took a leading part, particularly in the design and construction of braced structures, for which his course of study at the University College specially qualified him. Later, he gained valuable experience as an inspector of Purchased Materials, subsequently returning to the drawing office for further experience. In 1902 he was appointed an inspector in the Locomotive Works, and shortly afterwards an Assistant Manager, leaving that position to take up the duties he has just relinquished.

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INTERESTING details of passenger traffic in great cities are included in a report recently presented to the Manchester Corporation by Mr. J. M. McElroy, General Manager of the Corporation Tramways. In New York the surface lines aggregate 1,156 miles of track, and the underground and elevated railways, 296 miles. On the underground railway at Manhattan there are four tracks, two for express services and two for local services. It was originally built to carry 400,000 passengers a day, but it is now carrying over 1,000,000 daily, and the traffic is still increasing. A new scheme is now being prepared which will add 333 miles of rapid-transit lines. The cost will be about £68,000,000. In Chicago there are 666 miles of surface tramway and 143 miles of elevated line. It is estimated that in Greater New York 849,878,855 surface and 843,835,887 local railway passengers are conveyed annually, while in Greater London the corresponding figures are 1,349,109,979 and

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436,492,584. In the case of London a large number of passengers are carried on the local portions of main line railways, and these figures are not available.

* * *

THERE have recently been some interesting practical tests of different types of Automatic Time Recording machines, both in this country and abroad, with gratifying results to the British manufacturer. These tests were undertaken by public and other concerns employing considerable labour, in order to adopt a system providing the best efficiency and economy in expense, labour saving and general utility. The card system proved in each case the type selected, which has the advantage of being unlimited and admits of any reasonable increase of staff whether it be 1, 50, or 100 over the number originally provided for. In this system the workman has the opportunity of seeing and verifying the time record the moment he has made it without causing any delay whatever. The workman's record being separate and distinct forms the wages voucher and any mistake in the calculation of wages can be rectified when pointed out by the workman on the card voucher. The National Time Recorder Company, 5, Blackfriars Road, London, S.E., are the makers of the Patent Check Action Automatic Card System Time Recorders. These machines embrace a very valuable improvement on the ordinary time recorder. With these machines the workman cannot make the mistake of recording time in the wrong day space on the card, no matter what day the card commences. The time is not printed at all if the card is not inserted to the full extent. Equally important is that of obtaining the correct time occupied by each workman upon the work he is engaged upon. National Time Recorders are also admirably suited for this, no alteration being necessary to the machine. The same recorder answers for both wages and works costing. These machines are built of British Gunmetal and Steel at the National Company's works in London. They are in use by the Government, the Government of India, British and Foreign Railways, Metropolitan Water Board and a great number of important firms employing thousands of hands, both in Great Britain and abroad.

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THE Lord Provost of Glasgow has promised to bring before a committee of the Corporation the question whether the municipality should make overtures to the Glasgow District Subway Company for the purchase of their undertaking, so that it might be developed and made more valuable as a means of travelling from one part of the city to another. When this line was built electric traction was not considered fully past the experimental stage, and the directors of the company equipped the line for cable haulage. Soon after it was in working order the Glasgow Corporation equipped their street tramways with the overhead trolley system. The result was unfavourable to the subway, and the suggestion has been made frequently that the underground lines should be taken over by the Corporation and electrified, and used to relieve the congestion on the streets. It is urged that the Corporation, by improving the system and the service, and by working the lines in co-operation with the cars, could make them a valuable part of the city's transit facilities.

* * *

MR. HARTLEY'S statement at the annual meeting of the Maryport and Carlisle Railway was not encouraging. The company had a prosperous year, and the receipts under the principal heads showed an advance; but in the later months of the year the effects of the "slump" in trade began to be felt, and the falling away of traffic was so serious that the directors were compelled to place their men on short time, which, they considered preferable to dismissing a portion of them. The announcement that the traffic in North-Eastern coke, which was at one time the most considerable contributant to the company's profits, has ceased for good, except when the iron works in the West are exceptionally busy, was the most interesting feature of the speech. The smelters' wants are now fully met by the local ovens, which last year turned out about 400,000 tons, or about the amount of the North-Eastern coke which was formerly brought into the district over the Maryport and Carlisle Railway.

* * *

A CURIOUS method of expressing "The Height of Enjoyment" is adopted as the subject of a poster issued by the Paris, Lyons and Mediterranean Railway. Lying on the edge of an extremely narrow ledge high up on the mountain side, a somewhat corpulent tourist, smoking a cigar in evident enjoyment, is looking over the edge, the landscape showing motor cars and a train in the foreground, with an Alpine view suggested in the distance. The inscription is "Route des Alpes—Grand Excursions by rail and car to Mont-Blanc, Meije, Pelvoux."

* * *

THE work of constructing a new light railway from Dingwall to Cromarty was started recently the first sod being cut by Lady Bignold of Loch Rosque. About 18 miles in length, the line will pass through good agricultural districts, but the principal purpose served by its construction will be the connecting of Cromarty with the main line of the Highland Railway. Hitherto the only ways of reaching Cromarty have been by road or by ferry from Invergordon. Total constructional cost will be £96,000, of which the Treasury have contributed a free grant of £32,000 and a loan without interest of £16,000. Loans to the extent of £20,000 are being raised by the local authorities interested. The Highland Railway will work the line at cost for 50 years. It is thought that the work will be completed in less than two years, and that its commercial success is assured by the naval developments in the Cromarty Firth.

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ADDITIONAL coal tipping and wharfage facilities are being provided by the Port Talbot Railway and Dock Company. A reinforced concrete wharf 900 ft. long is nearing completion

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at North Bank, provided with four 2-ton hydraulic cranes and one of 15 tons capacity. Another large wharf of reinforced concrete is under construction, providid with three additional 2-ton hydraulic cranes and one 6-ton. The first coal-tipping belt conveyor has commenced work, and two more are under construction. An extension of 100 ft. in reinforced concrete is being made to the Crown Fuel Works Wharf, and an electric power station is being erected at Copper Works Junction. The company are also proceeding with the extension of the south breakwater for 1,000 ft. It is intended to proceed with the construction of a new entrance lock, 875 ft. long by 90 ft. wide, with three pairs of lock gates.

* * *

Among the new works to be undertaken by the Great Western Railway may be mentioned the following: Construction of a new goods depôt at Swan Village; enlargement and improvement of office and warehouse accommodation at Smithfield goods station; extension of up loop between north and south boxes at Shrewsbury and additional siding accommodation at Coton Hill; increased accommodation at Totnes for the Devon County Show traffic; extension of platforms at Redruth and provision of up bay line; additional mileage sidings at Hagley; an additional running line at St. Blazey between yard and junction with Par Dock line, Par bridge crossing; increased goods office and shed accommodation at Devizes; additional goods office accommodation at Newbury; substitution of gas lighting for oil lighting at Bassaleg and Hatton.

SAFETY IN RAILWAY TRAVEL: AS INTERPRETED BY THE LANCASHIRE AND YORKSHIRE RAILWAY.

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At the annual general meeting of the Institution of Railway Signal Engineers (Incorporated), the following Officers and Members of Council were elected for the ensuing year:—President, Mr. J. Sayers; Vice-President, Mr. A. Hurst; Hon. Treasurer, Mr. R. J. Insell; Hon. Auditors, Messrs. W. H. Cannon and A. H. Johnson; Hon. Secretary, Mr. W. H. Cotterill. Members of Council: Messrs. W. C. Acfield, C. Dutton, H. W. Firth, C. M. Jacobs, G. A. Neale, A. F. Rock, L. W. Williams, A. F. Bound, C. H. Ellison, A. H. Johnson, P. D. Michod, J. T. Roberts, F. Downes, R. G. Berry, and H. G. Brown. A paper by Mr. G. H. Crook was read on "Characteristics and Efficiency Factors of some typical Electric Signalling Circuits," and discussed at the general meeting on April 20th.

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Mr. L. A. P. Warner, Outdoor Goods Manager, Northern Division, London and North Western Railway, has been appointed Assistant General Manager of the Mersey Docks and Harbour Board. Joining the London and North Western Company at Abergavenny in 1892, in the following year he was removed to the Superintendent of the Line's office at Euston, where he was engaged until 1898, when he became an Outdoor Assistant to the Superintendent of the Line and stationed at Preston. In 1902 he was appointed Chief Outdoor Assistant at Euston, and in 1908 he was appointed District Superintendent at Chester. In June, 1910, he was selected to be District Goods Manager at Liverpool, and in 1913 he became Outdoor Goods Manager for the Northern Division.

* * *

There was a well-attended meeting of the Institution of Locomotive Engineers at Caxton Hall, Westminster, on Saturday, March 28th, when Mr. L. Rottenburg, of the New Transport Company, read, on behalf of Mr. A. L. Gattie, a paper entitled "Locomotive Costs in Relation to Total Cost of Railway Goods Transport." Mr. A. J. Hill, Locomotive Superintendent, Great Eastern Railway, President, occupied the chair. The paper was illustrated by means of diagrams and lantern slides, and was very well received. In the discussion which followed, a number of interesting points were raised, by the Chairman and other speakers and by the lecturer in reply.

* * *

At the annual meeting of the North Eastern Railway Lecture Society, Sir A. K. Butterworth was re-elected President; Mr. J. B. Harper, Chairman of the Committee; and Mr. J. E. Kennedy, Hon. Secretary. Awards for the annual essay competitions open to the whole staff were announced. The General Manager's prize was awarded to Mr. L. Youren, Chief Goods Manager's office, for a paper on "Railway Education." The Lecture Society's prize, open to members of the Society only, went to Mr. J. E. Kennedy, General Superintendent's office, with a paper on "The Future of British Railways."

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THE 1914 edition of the Great North of Scotland Railway Guide and List of Furnished Lodgings appears in an attractive pictorial cover, the contents being revised to date. A portion is devoted to descriptions of the principal places of interest served by the railway. Particulars are also given of tours, traffic arrangements and facilities, golf courses and other usual information for tourists. As regards its primary purposes, there is a comprehensive list of furnished lodgings and other accommodation for visitors, this being prepared on the usual comprehensive scale. Copies can be had on application to Mr. George Davidson, General Manager, Great North of Scotland Railway, Aberdeen.

* * *

LORD PLYMOUTH, chairman of the Barry Railway at the recent meeting of the proprietors, said arrangements had been concluded for the construction of the new patent fuel works at Sully, negotiations were in progress for other works, and contracts had been let for new dock gates at £16,810 and for ten locomotives at £35,000. They had added during the year 71 goods wagons at the cost of £7,947. The Barry Railway was providing six ne wtips enabling an additional 2,000,000 tons to be dealt with per year at their docks. Increased facilities had been provided at the docks, and very shortly they would be able to deal with an additional 2,000,000 tons annually.

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MR. CECIL J. ALLEN will give his paper on "Locomotive Hill Climbing" at the meeting of the Railway Club on Tuesday, May 12th. On Saturday, May 16th, members will visit the Great Eastern Railway engine sheds at Stratford. At the June meeting Mr. J. F. Gairns will deal with "Railway Signalling: Possible and Probable Developments." On June 20th there will be a visit to Mr. C. W. Bartholomew's model railway at Blakesley Hall. Other prospective arrangements include a visit to the South Eastern and Chatham Railway engine sheds at Slades Green (July 18th), and to the Corringham Light Railway (August 15th).

* * *

"PASTURES New" is the aptly chosen title of a little book just issued by the Metropolitan Railway Company for the guidance of pleasure party promoters, inasmuch as it leads the stranger through delightful districts in Hertfordshire and Buckinghamshire served by the Metropolitan and Great Central Joint Railway. Tersely written and well illustrated, this booklet should be secured by all who are promoting an outing during the coming year, for with its aid one can promptly settle the venue for a happy day. It can be obtained free at all stations, or from the Commercial Manager, Baker Street station, London, N.W.

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AT the fifteenth annual competition for Ambulance Teams on the Lancashire and Yorkshire Railway, at Belle Vue Gardens, Manchester, the eight teams who had qualified in the preliminary competition were judged by Capt. George Ashton, M.D., R.A.M.C. (T.), and Dr. R. D. Cran, of Manchester, the following marks being given: (1) Aintree Sorting Sidings, Liverpool, 230; (2) North Docks (No. 1), Liverpool, 222; (3) Bolton Station (No. 1), 219; (4) North Mersey, Liverpool, 204½; (5) Bolton Station (No. 2), 204; (6) Horwich Works (No. 1), 191½; (7) Liverpool (Exchange), 165½; (8) Halifax, 152.

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THE work of transforming the suburban lines of the London and South Western Railway for electric traction is proceeding rapidly, and it is hoped that trial trips will be possible on the Wimbledon loop by the end of June or early in July. This portion of the line is at present used by the District Railway between Putney Bridge and Wimbledon as well as by the London and South Western, though it belongs entirely to the latter company. As the new power station at Wimbledon will not then be completed, power will for a time be obtained from the Underground Power station at Lots Road, Chelsea.

* * *

THREE notable lithograph posters have been issued by the Caledonian Railway. One of these is reproduced. It is the third of the "Golfing Girl" series of posters, and ranks as one of the most effective railway advertisements ever exhibited. The others are of larger size, advertising Strathearn and the Southern Uplands respectively, two districts which have much in common. The artist, in scheming the posters, plays on the similarity, yet in the general treatment of the pictures and wording he has produced two distinctive and striking posters.

* * *

ON the occasion of his leaving the Great North of Scotland Railway to take up the duties of Locomotive Superintendent of the Caledonian Railway, Mr. William Pickersgill was presented with a silver tray and tea and coffee service. The presentation was made by Sir David Stewart,

THE 1914 "GOLFING GIRL" POSTER; CALEDONIAN RAILWAY.

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Chairman of the Company, who expressed regret at the departure of Mr. Pickersgill and the directors' appreciation of the most efficient manner in which he had always carried out the work of the locomotive department.

* * *

AN Oxford reader points out that the Rhondda tunnel on the Rhondda and Swansea Bay Railway, is not, as stated by Mr. Asthurton last month, the longest in Wales, seeing that its length, 3,443 yards, is exceeded by the Festiniog tunnel, also single line, being 3,726 yards long. The latter is the longest in the United Kingdom for both-direction single line traffic, but Woodhead tunnel, Great Central Railway, is even longer, and there are, in that case, two single line tunnels.

* * *

AT a farewell meeting of the Great Southern and Western Railway Engineering Association at Dublin, Mr. R. E. L. Maunsell, late Locomotive, Carriage and Wagon Superintendent, Great Southern and Western Railway, and now Chief Mechanical Engineer, South Eastern and Chatham Railway, was presented with an illuminated address and a pair of binoculars. At a smoking concert of the foremen and employés, Mr. Maunsell was handed another illuminated address.

* * *

THE LOCOMOTIVE PUBLISHING CO., LTD., have added to their series of model locomotive paper weights, a larger design representing London and North Western four cylinder 4-6-0 locomotive No. 1191, *Sir Frank Ree*. About 9 inches long the model is sufficiently large to give a good impression as to the reel engine, most of the characteristic features being reproduced or suggested, and the painting and lining being well done. They are sold at 5s. 6d. each.

* * *

THE death occurred recently of Mr. John Thompson, Storekeeper, Furness Railway, one of the most respected officers of the company. His portrait appeared in the RAILWAY MAGAZINE, July, 1913. Mr. Thompson entered the service of the Furness Railway in July, 1866, and was appointed Storekeeper in September, 1896. He was for some years previous to this appointment, Chief Clerk to the late Sir James Ramsden, then Managing Director of the Furness Railway.

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THE immunity from accidents in railway travelling on the London and South Western Railway is phenomenal. On this railway lock-and-block signalling was commenced many years ago, and this method of protective signalling, as also the use of track circuits, is now largely employed by the South Western.

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MR. E. J. O'B. CROKER, Irish Traffic Manager, Great Western Railway since 1903, has retired on reaching the age limit. For many years he was in the service of the Great Southern and Western Railway, and in 1894 was appointed General Manager of the Cork, Bandon and South Coast Railway.

SIR CHARLES J. OWENS has been re-elected Chairman of the Committee on Railway Subjects at the London School of Economics. A feature of next session's course will be a series of lectures on the financial and other aspects of electric railway working.

* * *

COMMENCING July 1st a luncheon car will be run on the 11 a.m. express from Dublin to Cork, Great Southern and Western Railway, and also on the fast portion of the 12.45 p.m. train from Cork, due at Kingsbridge at 4.20 p.m.

* * *

A NEW power station is being erected by the Lancashire and Yorkshire Railway at Clifton Junction, to supply the lines to be electrified from Manchester to Bury *viâ* Crumpsall.

* * *

WE have received from Bells United Asbestos Co., Ltd., an interesting booklet dealing with a fireproof composition flooring called "Decolite" manufactured by them. This flooring is, we understand, the outcome of a large number of experiments carried out by that company nine or ten years ago with a view to improving upon the existing composition floorings and eliminating the defects generally associated with their use. The method of manufacture and materials used were altered and the mixing and laying entirely revised. "Decolite" is made of the finest materials obtainable, including asbestos, and is also laid in such a manner as to ensure a tough, elastic, homogeneous and hard wearing floor. It has been put to many practical and severe tests both in rolling stock and in buildings and the results are so satisfactory that its use is rapidly extending. "Decolite" is very comfortable and warm to the tread, its non-conductivity comparing favourably with hard wood and its fireproof qualities are beyond reproach. "Bells United Asbestos Co. are also specialists in the manufacture of "Salamander" Ceiling Panels and "Uacolite" etc; all useful fire-resisting articles for rolling stock for which there is no doubt a large future and which are being extensively used, particularly in connection with the new electrification schemes."

THE electrification of the Buenos Ayres Western Railway Suburban System is one of the largest railway electrification schemes yet undertaken, and a few particulars of the cables may be of interest to readers, both technical and general. The contract for supplying and laying the whole of the cables in connection with the undertaking has been secured by Messrs. W. T. Henley's Telegraph Works Co., Ltd., which firm, it will be remembered, also secured a similar contract in connection with the electrification of the Suburban lines of the Central Argentine Railway, the cables for this latter undertaking being now in course of installation. The Buenos Ayres Western Railway System will be operated at a pressure of 800 volts direct current. Energy will be generated at 2,500 volts, 25 complete cycles per second, and transformed to 20,000 volts by means of three single phase step up transformers connected directly to the terminals of each generator. This will then be transmitted to five substations, the feeders to two substations being run in duplicate. These

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substations will be equipped with rotary converters for transforming the three phase current to continuous current at the pressure of 800 volts and from there connection will be made to the conductor rail. The principal cable item is one of approximately 116,000 metres of ·10 sq. inch three core, split conductor, paper insulated, lead covered, and steel wire armoured cable which is to be used for feeders at the working pressure of 20,000 volts. The track cable consists of about 17,000 metres of single core, paper insulated cable, part of which will be lead covered and single wire armoured, and part sheathed with vulcanised bitumen, taped, braided and laid solid in fibre troughing. The contract also includes the supplying and laying of about 58,000 metres of dry core, lead covered and wire armoured telephone cable and of course the necessary terminal boxes, pillars telephone apparatus and accessories, of which a very large quantity will be wanted. This is the largest contract that has ever been placed for any power cable installation, and follows the Central Argentine Railway contract secured by the same firm, which at the time it was placed was also a record. Moreover, the portion of the work that has been put in hand by the Railway Company represents a part only of the complete scheme, which is divided into two sections—Section A, to which the contract under notice applies, being the larger of the two.

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WHILE the larger portion of the new Windsor station and offices of the Canadian Pacific Railway at Montreal has been complete for some time past, there has been much work to do in the way of putting the finishing touches here and there, to give completeness and perfection to the ensemble. On the main floor it was necessary to lay down new flooring, open up an information bureau, a nursery, a luncheon and dining room, where not merely the employés, but the general public, can be sure of appetizing dishes at moderate prices. Part of the plan was to incorporate the old front entrance on Osborne Street with the great concourse and give a new entrance on the corner, with modern and rapid elevators. This work is now completed, and three new elevators in the northeast corner of the old building, facing at once on Windsor and Osborne Streets, have been opened to the public. The old luncheon room is now beautifully tiled and wainscotted with marble, delicately veined, and exquisite in polish and colour, while the elevators express the latest word in speed, comfort and reliability. The whole space which was devoted to the public, the ticket offices extending the whole length of the building, will now be taken over by or incorporated with the new concourse, which, large and dignified as it is, will be considerably augmented, thus giving to it a sense of impressiveness and space, which will be much appreciated by the travelling public. With a new entrance, new elevators, a big clock facing the public, the improvements and renovation will give to the old building a new and desirable character in keeping with that which the great station and office building presents to the eye from Osborne or St. Antoine Street, and which on St. Antoine Street will, with completed buildings, soon extend to Mountain Street, thus forming in one great and dignified whole the finest terminal, almost, it might be said, on the American continent.

REPORTING on the production of petroleum in 1912, Dr. D. T. Day (of the United States Geographical Survey), deals with the subject of the adoption of oil fuel on American railways. He points out that during the year there was a large increase in the number of companies adopting oil as a fuel, but makes the statement that in 1913 there was a change back to coal in many instances, owing to the high prices charged for oil. Forty-eight railway lines in the United States used oil as fuel during 1912. The consumption of fuel oil by railroads amounted to 33,605,598 barrels in 1912, an increase of nearly 13 per cent. The number of miles of railroad operated by the use of oil declined from 30,039 miles to 28,451 miles. The total mileage, however, made by oil-burning engines increased —in other words, more trains were run on less track. In 1906 the number of miles made for each barrel of oil consumed was 3·93. This figure has declined almost continuously since then, till in 1912 only 3·61 miles per barrel was the result. The decrease in number of miles operated by oil is due to the return of a few railways to coal. On one railway this was due to the partial exhaustion of oil fields adjacent to the portion of the line which went back to coal. On another line the change is attributed to the increased cost of fuel.

* * *

AN experiment undertaken by the Pennsylvania Railroad in Pittsburgh of arranging for the exchange at station ticket offices of mileage coupons for ordinary railroad tickets has proved such a convenience to passengers that the privilege was, on December 1st, extended to those taking trains at Philadelphia, New York, Newark City, Jersey, Trenton, Phillipsburg, N.J., Lancaster and Harrisburg. The new plan is this: Anyone intending to ride on a Pennsylvania Railroad train overnight, and who owns a book of mileage coupons good on the Pennsylvania Railroad, can, if desired, take the mileage book to a ticket office and exchange the required number of miles for an ordinary ticket. In this way a passenger gets the benefit of the low mileage rate and has his mileage coupons cancelled in his presence. This practice was inaugurated to insure accuracy in cancelling mileage coupons, and to avoid the confusion and delay in delivering mileage books to passengers at the end of a journey. In short, this rule is designed to eliminate inconveniences that can arise from passengers surrendering their mileage books to Pullman conductors overnight.

* * *

IT is not without interest to note that the gross capitalisation of the Canadian Pacific Railway per mile is greatly below the average which other big systems show in the United States. The fixed charges of the Canadian Pacific Railway are under $18,000 per mile, as against an average of $38,000 per mile. The lines compared are the Atchison, Topeka, Great Northern, Northern Pacific and Union Pacific. As to the balance-sheet value of the railway and equipment per mile, the average for the lines indicated for 1913 was $72,000 per mile, while for the Canadian Pacific Railway it was only $35,000 per mile. If the equipment of the Canadian Pacific Railway be taken as of equal value with the average of the lines named, there would be assets representing the ordinary of $300 per ordinary $100 share without allowing anything at all for land.

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SOMERSET AND DORSET JOINT RAILWAY 2—8—0 LOCOMOTIVE No. 80.

Designed by Mr. Henry Fowler and built at the Midland Railway Locomotive Works, Derby. Cylinders: diameter, 21 in.; stroke, 28 in. Diameter of coupled wheels, 4 ft. 7½ in. Heating surface, 1,681 sq. ft. Steam pressure, 190 lbs. Grate area, 28·4 sq. ft. Weight of engine in working order, 70½ tons. Weight of engine and tender, 116¼ tons. The locomotive is fitted with Schmidt Superheater.

Published by "THE RAILWAY MAGAZINE."

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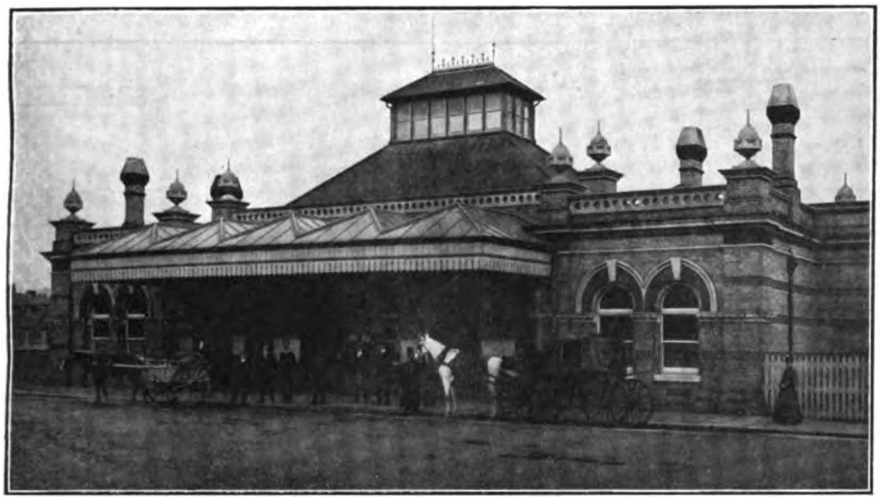

Photo] [*G. F. Burtt.*

EXTERIOR OF PRESENT STATION.

Notable Railway Stations and their Traffic.

LEWES—LONDON, BRIGHTON & SOUTH COAST RAILWAY.

By G. F. BURTT.

ALTHOUGH not one of the largest stations in the United Kingdom, and notable rather in respect of its location, connections and traffic, Lewes, the county town of Sussex, ranks as one of the most important traffic centres on the London, Brighton and South Coast Railway. Moreover, a review of the development and facilities of the station at Lewes includes many features of special interest.

In history the town of Lewes has figured prominently. In Roman days, under the name of *Mutuantonis*, it was a junction of no fewer than five of those wonderful roads which carried the major portion of the traffic of the country. Under the Saxon Kings, the town of Lewes—the derivation of the name is unknown, but the present designation can be traced back for quite a thousand years—retained a degree of importance. Athelstan is said to have established two mints in the town, and the great Alfred's association with the district was considerable. It was, however, with the coming of William the Conqueror that Lewes attained its real celebrity.

The Priory of St. Pancras was built soon after, and the ruins are close alongside the railway on the south side. It is stated that in 1845, when the line from Lewes to Brighton was being constructed, excavations in the Priory grounds revealed the remains of William, the first Earl de Warrenne and the builder of the Priory in 1077, and of his wife, Gundrada. The Castle was built about 1330 by John, the eighth and last Earl de Warrenne. Although now little more than a mass of ruins, rendered picturesque by the hands of time, the Castle still dominates the town. Many a conflict has raged about its walls, from the Battle of Lewes in 1264, to the minor skirmishes which characterised those stirring times. The southern and western towers were, until recent years, used as the Museum of the Sussex Archæological Society; but this has since been transferred to Barbican House, opposite the Castle entrance.

To-day, Lewes is important as the County town of Sussex, a municipal borough, an assize and market town, and the centre of a wide-spreading and prosperous agricultural area. It possesses several notable buildings and churches, and with a population of about 12,000, maintains its importance even in view of its nearness to Brighton and more modern towns such as Eastbourne and Hastings. Although not exactly an industrial centre, a considerable business is

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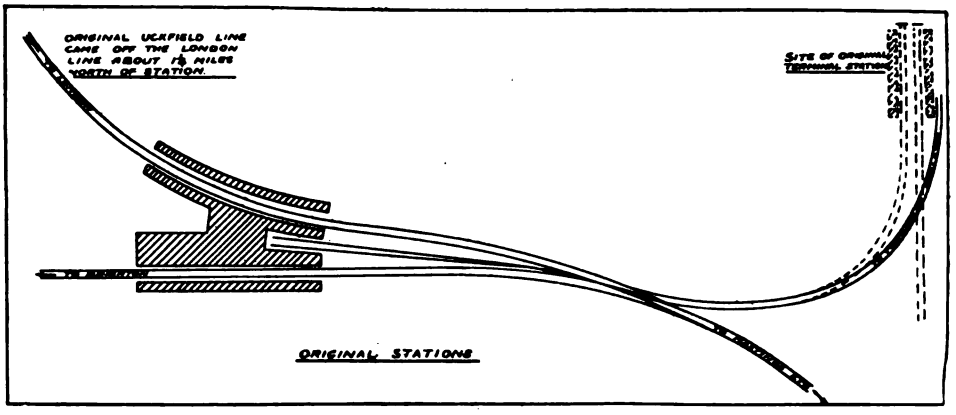
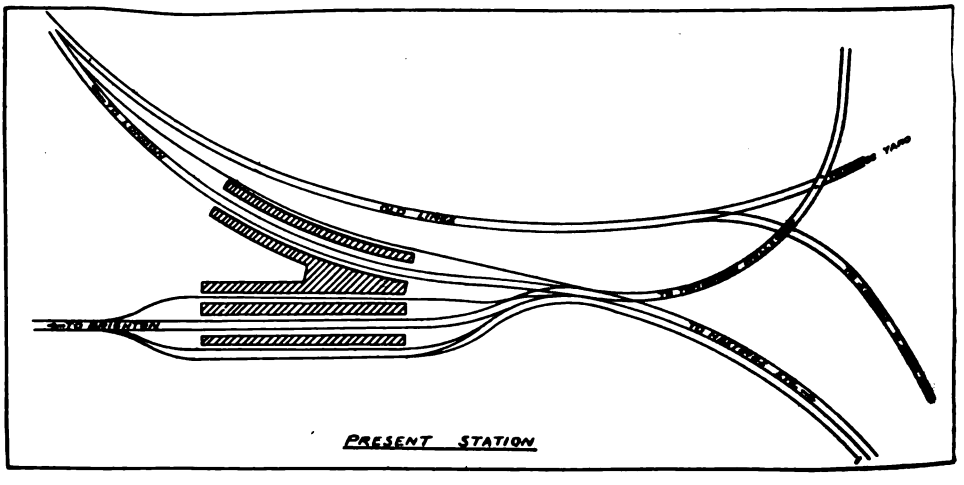


PLAN SHOWING SITE AND ARRANGEMENT OF THE OLD STATIONS AT LEWES.

done by cement firms, operating quarries in the vicinity, notably the Lewes Portland Cement Co., Ltd. There is also a fairly extensive trade in manufactured iron work, including bridges and girders, by the firm of J. Every, which also operates the largest iron foundry in the south, notwithstanding the fact that the Sussex iron industry, which once counted for so much, has virtually died out; while several breweries in the town, particularly the South Down and East Grinstead Brewery Co., serve a large area extending for many miles in all directions. As the centre of a well-populated and agricultural area, with a weekly cattle and general market for which people gather from many miles in all directions, and for general trading, Lewes counts for a great deal; while there are few inland towns more favoured for residential purposes by business men engaged in Brighton and other neighbouring towns, a number who travel to and from London daily or several times a week, and many retired and leisured people who have made their homes in the Sussex county town.

There is, indeed, a great deal to commend Lewes for residential purposes, owing to its favourable and picturesque location, its contiguity to Brighton, Seaford, Newhaven, Eastbourne and Hastings, and the beautiful country to be found close by, while it is a convenient centre for a quiet holiday or for touring the district.

It is, however, as a railway centre that Lewes calls for present consideration, and here there is much of special interest. Although additions to the original London and Brighton Railway were first made on the western side—in fact, the Brighton and Shoreham line antedated the completion of the London route—work was soon



PLAN OF PLATFORMS AND LINES IN THE EXISTING STATION.

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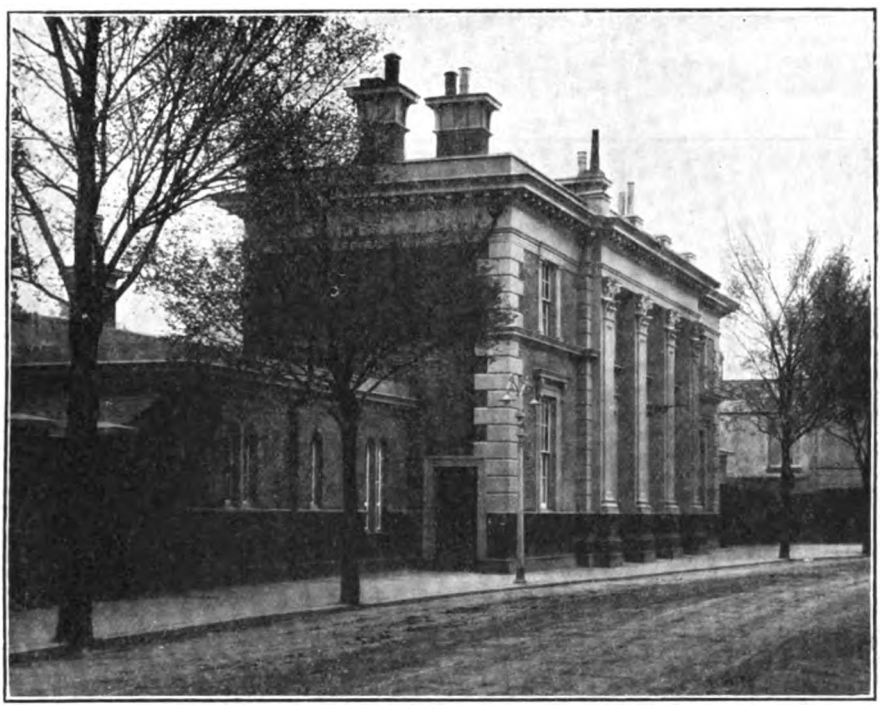
undertaken towards the east, and Lewes was reached from Brighton in 1846, traffic being inaugurated in June 8th of that year; while the extension to Hastings followed very shortly after. In 1847 the Keymer Junction —Lewes and Lewes—Newhaven lines were completed, so that even at that early date Lewes had become an important traffic centre. Indeed, as the original station was of a terminal character, as will be noted in due course, trains working in and out again even when making a continuous journey, Lewes was even then served by four routes, from Brighton, from Keymer Junction (the Keymer Junction being distinct right into the station, the Hastings and Newhaven branches are combined for about three-quarters of a mile between Lewes and Southerham Junction, and the Tunbridge Wells and Horsted Keynes routes are combined between Lewes and Culver Junction (near Barcombe), when they divide, serving separate stations at Barcombe and Barcombe Mills respectively. Thus, at Lewes station itself there is a quadruple junction, while traffic is of a sextuple character, apart from divergencies further afield.

As already mentioned the original station



Photo] *[G. F. Burtt.*

ORIGINAL STATION BUILDINGS, NOW USED AS STATIONMASTER'S RESIDENCE.

connection with the main line, just south of Wivelsfield station), Hastings (and Eastbourne,' opened in 1849) and Newhaven.

Remaining lines centreing upon Lewes are those from Tunbridge Wells, and from East Grinstead, the Lewes and Uckfield section being opened in 1858, and the extension to Groombridge in 1868, while the Barcombe-Horsted Keynes line was completed in 1882. The Newhaven branch was extended to Seaford in 1864.

There are thus six routes of travel meeting at Lewes, the lines from Brighton and from was terminal, on a site now included in the goods station. The old station buildings were of an interesting character, and somewhat imposing in style. They can still be seen, though now used as the stationmaster's residence. In the garden there still remains a portion of the original platform, though subsequent alterations have hidden and curtailed this feature. There were, as far as can be ascertained, merely the usual two platforms, and trains entered and left at the same end, whether terminating at or starting from Lewes, or calling *en route* to

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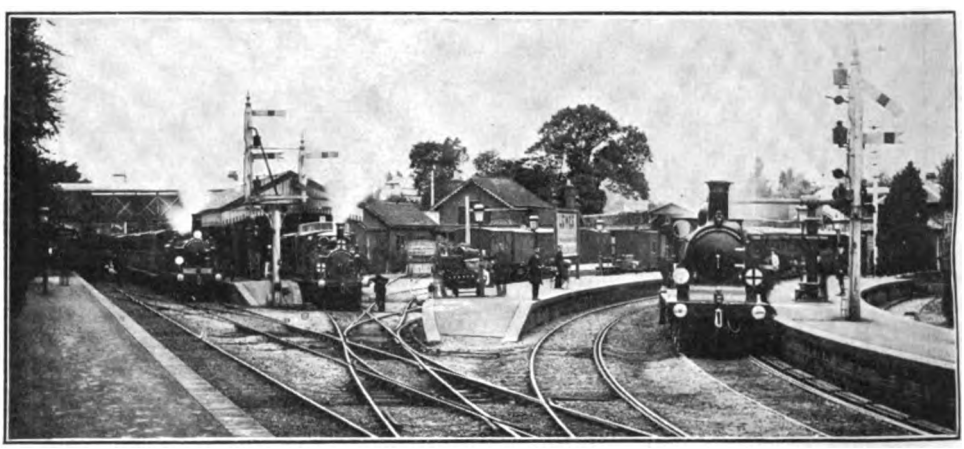
London, Hastings, Brighton or Tunbridge Wells.

The Uckfield line originally joined the Keymer Junction route at Hamsey on the western side of Lewes so that the Hastings and Newhaven trains were the only ones leaving towards the east; but subsequent changes, and the curved arrangement of the lines at Lewes, have so complicated matters that it is difficult to identify many of the early characteristics.

The first change occurred shortly after construction. It was found that the connection of the Uckfield line was too inconvenient, and in 1868 the Lewes and Uckfield Junction line was opened, giving access on the east side instead of the west. It was, however, in 1877 that the first great transformation was effected. The old station



THE ORIGINAL THROUGH STATION.
(From a photograph kindly lent by E. Bedford, Esq. Eastbourne.)

was then superseded by a new one, on an adjacent site, converting Lewes into a through station, adapted for dealing with connecting traffic. This new station, though located substantially on the same site as the present one, but nearly at right angles thereto, is curiously similar in general design to the station of to-day, which dates from 1889.

The second station consisted of two sharply curved platform lines from Keymer Junction, and two others for trains to and from Brighton, with a central bay for branch trains between the two. Eastwards there was an almost immediate division into two lines, still curving very considerably, for Hastings and Newhaven traffic, and two others for the Tunbridge Wells and Horsted Keynes trains, rising sharply on an ascending brick viaduct to cross Cliff High Street. The latter viaduct passed immediately behind the original station buildings, and portions can still be seen beneath the present viaduct, though the rest has been removed to enable the ground area involved to be utilised by the goods department in view of the 1889 alterations.

It will be seen that Lewes station as thus remodelled, while avoiding the terminal characteristics, was essentially a station of many curves; and it must be confessed that even in its present form this feature is rather more prominent than is desirable from the traffic operating point of view. The trouble is that Lewes tunnel, on the Keymer line, the hill immediately adjoining, and the location generally, effectually prevent any other scheme being adopted, or even extension of platforms to an extent sufficient to be of real value, except at very great expense.

The erection of the present station involved the construction of a new series of curves, and a new viaduct for the Tunbridge Wells and Horsted Keynes trains, with consequent alterations. The old main lines are still used for through goods trains. Portions of the down main platform are still existing, with a portion of the up Brighton platform under a bridge carrying a private road across the railway premises. A signal cabin here, and such portions of the platforms and buildings which remain, are utilised by the engineering department as stores or for miscellaneous purposes. In

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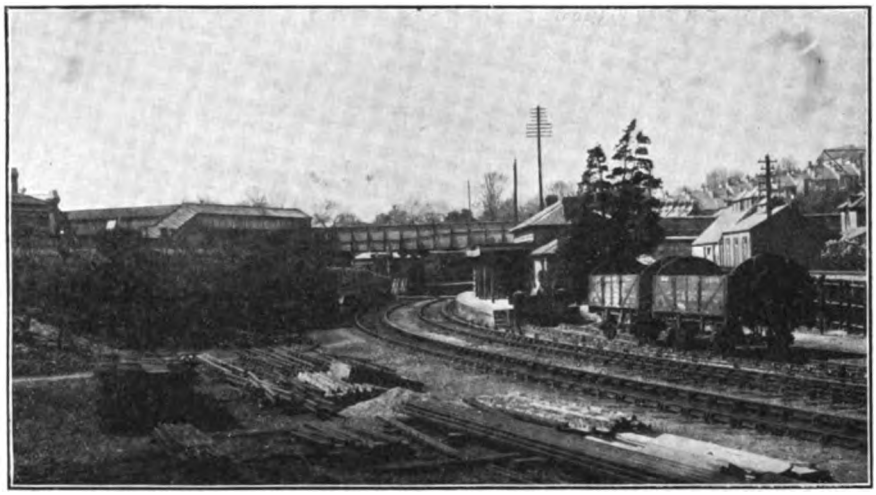


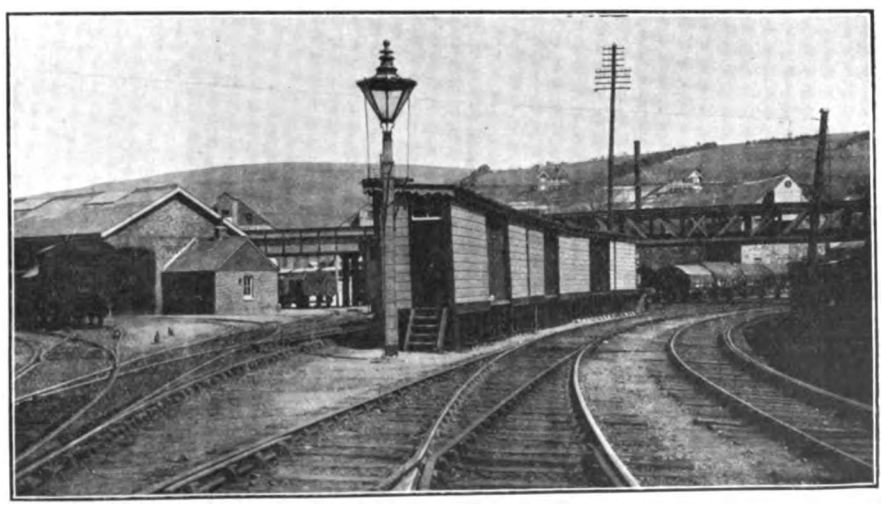
Photo] [*G. F. Burtt.*

SITE OF THE OLD STATION, SHOWING POSITIONS OF PLATFORMS REMAINING. THE EXISTING STATION BUILDINGS CAN BE SEEN IN THE BACKGROUND.

extension of the portion of the old up Brighton platform still in existence, a further section remains as a banked-up path therefrom to the horse-loading dock in the modern station. An easier curve was given to the main lines, with a new approach from Brighton, though even now the speed limit for non-stopping trains is 10 miles an hour.

The down main platform is an island, the line on the outer side constituting a loop or relief for connecting or branch trains. Just beyond are horse and carriage loading docks. On the Brighton side there are four lines, a loop for east-bound trains served by platforms on both sides and convenient for connecting traffic and for the departure or arrival of local and branch trains or motors, the main east-bound line, the west-bound Brighton line, and a loop thereto.

Immediately beyond the platforms all these lines converge into two, and immediately divide, the Tunbridge Wells branch diverging



Photo] [*G. F. Burtt.*

GOODS YARD, SHOWING VIADUCT FOR TUNBRIDGE WELLS BRANCH.

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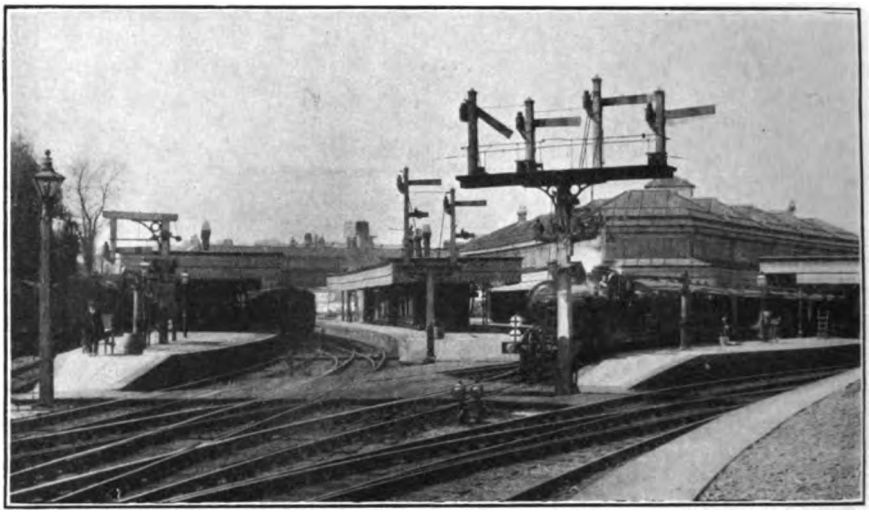
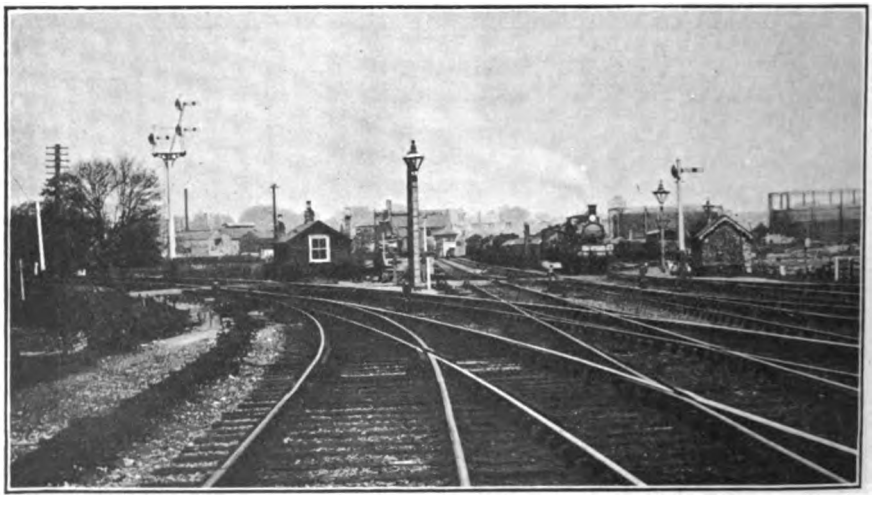


Photo] [*G. F. Burtt.*

GENERAL VIEW OF PRESENT STATION.

to the north and rising on a steep grade and a sharp curve to a lattice girder bridge over the goods lines and a girder viaduct over the goods yard, to join the original viaduct shortly before crossing Cliff High Street, while the main lines continue eastward, until they are joined by the through goods lines. A little way beyond is the bridge over the River Ouse. This has a removable section which can be lifted out by arrangement to allow river traffic to pass, though this is now only required very occasionally. Just beyond the bridge the Newhaven branch continues on the straight, the Hastings and Eastbourne trains diverging on an easy curve to the left.

Attention may now be directed to the construction and arrangement of the station itself and its buildings and accessories. Public entrance is from Station Road which crosses the railway area by bridges extending over the platforms. The exterior of the station building gives a good impression, and the booking hall is of modern character.



Photo] [*G. F. Burtt.*

THE SORTING SIDINGS: PRESENT MAIN LINES DIVERGE TO THE LEFT, OLD MAIN LINES STRAIGHT AHEAD THROUGH THE SIDINGS.

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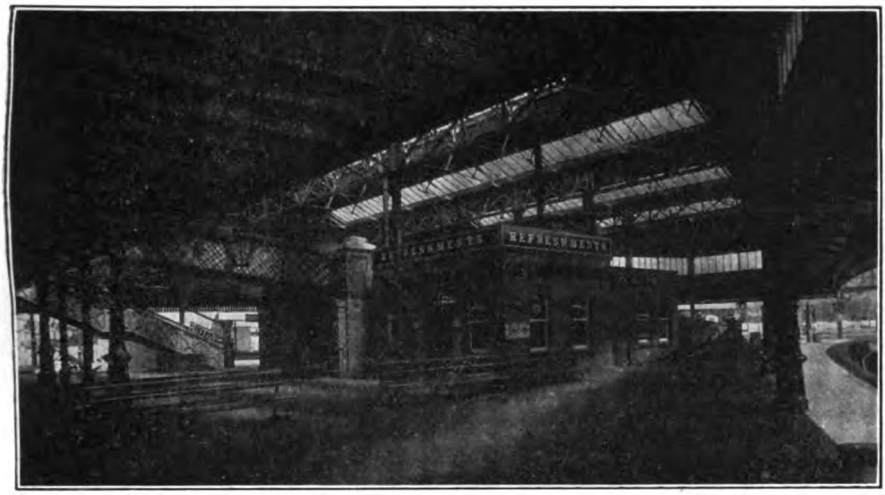
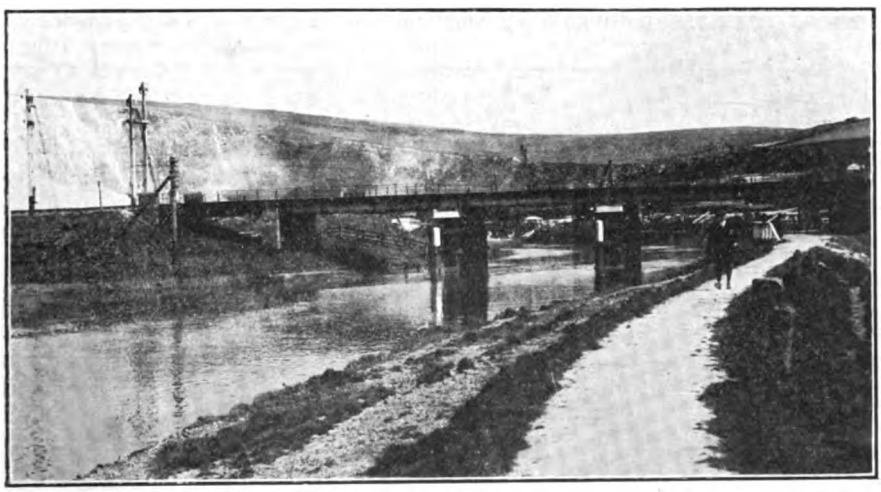


Photo] [*G. F. Burtt.*

THE MAIN CIRCULATING AREA SHOWING REFRESHMENT AND DINING ROOMS, ETC.

with conveniently arranged booking offices, bookstall and other conveniences. From the booking hall access is given to a wide covered footbridge extending over the whole of the station, with stairways to all platforms, and an inclined roadway for luggage leading down to the wide circulating area between platforms Nos. 2 and 3, constituted by the angular design of the station. Along the footbridge are the parcels and other offices, while the stationmaster's, inspectors' and other staff departments are below the main buildings on platform level.

Platforms are numbered 1 to 4 inclusive, serving seven lines. No. 4 (Main and Loop) is used for trains towards Brighton and arrivals from Tunbridge Wells and East Grinstead ; No. 3 (Main and Loop) for trains from Brighton and departures to Tunbridge Wells and East Grinstead ; No. 2 is the up main, and No. 1 the down main and down loop lines. A remarkable feature is that at Lewes there are no fewer than four refreshment rooms, all under the charge of Messrs. Bertram & Co. In the circulating area between platform Nos. 2 and 3 there are dining and tea rooms on a comprehensive basis, besides an ordinary refreshment room ;



Photo] [*G. F. Burtt.*

SOUTHERHAM LIFT BRIDGE.

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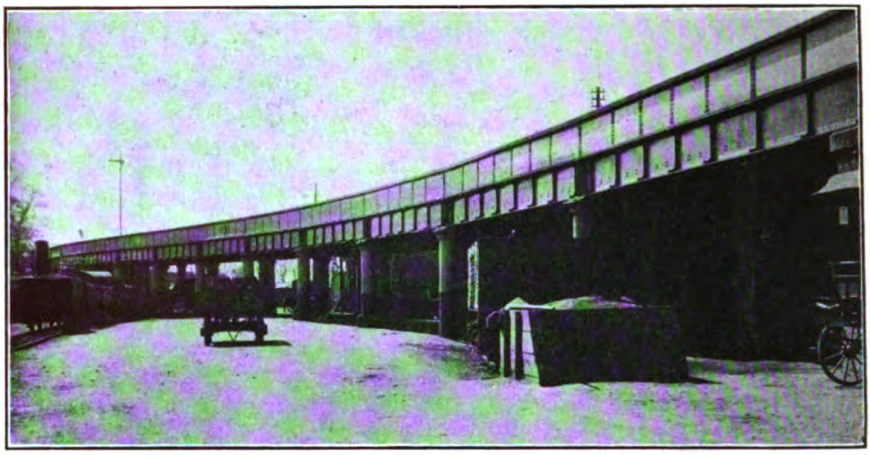

Photo] [*G. F. Burtt.*

GENERAL VIEW OF THE TUNBRIDGE WELLS VIADUCT OVER AND ALONGSIDE GOODS YARD.

and usual accommodation is provided on the three islands in the station. Tea and luncheon baskets are here supplied by arrangement to passengers passing through Lewes, while cups of tea and light refreshments are supplied to the trains by lads in the employ of the contractors.

The wide area between platforms 2 and 3 is covered by a neat glazed roof of transverse ridge and furrow type, giving the station a well lighted and pleasant appearance, in conjunction with the effective scheme of painting and decoration. The island platforms have verandah roofs. Towards the Brighton end of No. 3 loop platform the wall is bordered by neat flower beds, while beyond No. 4 platform line a considerable area of ground is cultivated by the Company for the supply of flowers to the various stations.

Traffic is controlled by four signal cabins. Lewes Main (104 levers), just beyond the platforms at the eastern end, governing the principal movements; Lewes East (33 levers) further along in the same direction, with controlling of up and down goods lines; Lewes West (38 levers) on the up main line platform near the tunnel mouth with control of up and down goods lines; and Lewes South (42 levers) on the Brighton side of the station. Under the charge of the Lewes stationmaster are two other cabins. Southerham Junction (22 levers), controlling the junction of the Newhaven line, and Ashcombe box (6 levers) about 2 miles in the direction of Brighton. Lewes Main

Photo] [*G. F. Burtt.*

VIADUCT OVER GOODS YARD, TUNBRIDGE WELLS BRANCH.

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MR. MARCHANT,
Stationmaster.

cabin has three regular signalmen in 8 hour shifts, with a relief man assisting during the busiest hours. The others are single man boxes, working on 8 or 10 hour shifts. The signalling is of an ordinary character, each of the starting signals having a corresponding arm or disc for shunting movements. Distants are given for the principal routes only through the station.

The traffic passing through Lewes consists chiefly of London–Eastbourne and Hastings; Brighton–Eastbourne and Hastings; Brighton–Seaford; Brighton–Tunbridge Wells; Brighton–East Grinstead and London; and Lewes–Newhaven and Seaford trains; with Lewes–Uckfield or Newick motor trains, and a few other locally arranged services. There are also the Newhaven Continental trains passing through and calling at Lewes, and besides the considerable volume of interchange traffic, a few trains have through carriages to and from Seaford transferred from one line to another, in connection with London–Eastbourne and Hastings expresses. Virtually all trains stop at Lewes except certain Eastbourne expresses, and these have to traverse the curves slowly. All classes of engines and rolling stock used on the London, Brighton and South Coast Railway are included, though the 4–6–2 tank engines are very infrequent visitors, and some of the large Pullman cars are rather too close a fit to pass through Lewes tunnel without special care, so that a degree of selection is necessary as far as these vehicles are concerned.

Mr. Marchant, the stationmaster, has been in charge at Lewes for about nine years now. He was previously stationmaster at Purley, Thornton Heath, Gipsy Hill and Hever. He has about 70 men under his charge, including 2 inspectors, 2 booking clerks, 2 parcel clerks, 2 telegraph clerks, 1 relief clerk, 16 signalmen, with porters and other grades, and 2 goods foremen and one assistant foreman on the goods side. All shunting and traffic movements are under the stationmaster's direction, though the commercial side of the goods department is under the direction of the Goods Agent, Mr. Bentley. The latter gentleman has a staff of 6 clerks, 7 porters and checkers, 4 carmen, one truck-horse driver (for yard shunting), one van guard and one yardman. Mr. Bentley's office is attached to the goods warehouse in the goods yard. Nearer to the passenger station is a tranship shed, and there are also provided pens for the cattle traffic.

About 200 passenger trains use Lewes station daily, with 20 or 30 additional in the summer. On the Saturday before August Bank Holiday the total reaches nearly 300. There is a fair amount of special traffic. Lewes Races bring extra trains about five times in the course of a year.

As the district is an ideal one for manœuvres it is not surprising that Yeomanry and territorials are encamped on the Downs every year, which necessarily entails a good deal of work in loading and unloading these special parties. These are often "army" detachments, and the railway staff

MR. BENTLEY,
Goods Agent.

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have also to deal with guns, ammunition, horses and other impedimenta, sometimes almost on a war footing, so that the pressure is then very considerable.

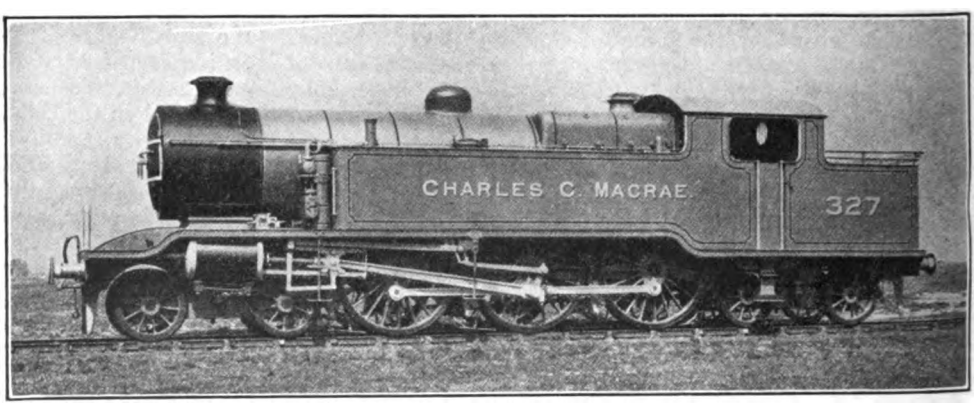
There are about 10 racing and training establishments in the vicinity, and this entails a large amount of horsebox traffic, about 4,000 horses being usually entrained annually for one reason or another. Meets of the South Downs Foxhounds, kennelled at Ringmer, about three miles away, also call for special accommodation and special trains at intervals. Milk traffic is another heavy item, while the cattle, agricultural and general trade in the aggregate render Lewes an important centre.

Normally 51 goods trains pass through Lewes in the course of 24 hours, five of these being fast, the others involving transhipment and shunting. Apart from through vehicles, 9,846 wagons were scheduled as transfers in the course of a week, the last time a census was taken, so that the goods side is by no means a small factor. Most of the goods traffic is, however, done at night. The quarry traffic connects near Southerham Junction, so that the 15-25 trucks constituting the output of the quarries as a normal day's work, are largely dealt with outside the station area. Local coal and the iron and brewery trades also entail a considerable amount of traffic, and Mr. Bentley's office is far from being a sinecure. He has been at Lewes for six years, being engaged previously at Horsham and Brighton.

In conclusion the writer may express his indebtedness to various officers of the London Brighton and South Coast Railway, and to Messrs. Marchant and Bentley for co-operation and assistance.

4-6-4 Express Tank Engine: London, Brighton and South Coast Railway.

Designed by Mr. L. Billinton, Locomotive Engineer.



ALTHOUGH the express tank engines used on the London, Brighton and South Coast Railway rank among the most remarkable in service in the United Kingdom, Mr. L. Billinton has now proceeded even further by introducing a 4-6-4 superheater design, the first engine of the class being illustrated herewith. It is the largest express tank engine yet introduced, being exceeded only by certain heavy shunting tank engines.

The boiler has a Belpaire firebox, Robinson superheater, and other special features, and a Weir feed pump is used in conjunction with a feed-water heater. Walschaert valve gear, mechanical lubricator, and piston valves are included in the equipment.

Leading dimensions are as follows:—

Cylinders	.. .. ..	..	22 in. × 28 in.
Coupled wheels	.. .. ..	..	6 ft. 9 in.
Bogie wheels	.. .. ..	..	3 ft. 6 in.
Coupled wheelbase	.. .. ..	..	14 ft. 9 in.
Total wheelbase	.. .. ..	..	40 ft.
Steam pressure	.. .. ..	..	170 lb.
Heating surface, tubes	.. ..	..	1,535 sq. ft.
,, firebox	.. ..	..	152 sq. ft.
Heating surface, superheater	..	..	383 sq. ft.
,, total	.. ..	..	2,070 sq. ft.
Grate area	.. .. ..	..	26·7 sq. ft.
Adhesion weight	.. .. ..	..	56½ tons
Total weight in working order	..	..	98 tons
Tank capacity	.. ..	..	2,700 galls.
Coal capacity	.. .. ..	..	3½ tons

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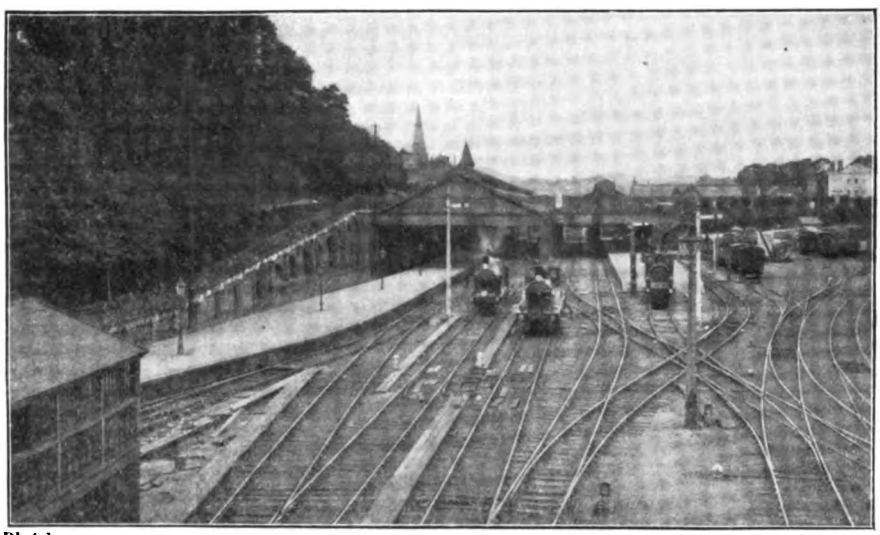
The London and South Western Railway in South-East Devon.

INTERMEDIATE between the Sussex coast and the Devon and Cornwall peninsula beyond Exeter, almost the whole of the sea border on the south is served by the London and South Western Railway, from Portsmouth on the east as far west as Exmouth, the only real exception being Great Western association with Weymouth, Portland and Bridport. Of this length of coast line, bordered every few miles with holiday and health resorts, sufficiently varied in climatic and scenic attractions to suit all requirements, tastes and purses, the Hampshire and Dorset portion is well known, including Bournemouth, Swanage, Poole, and other places served by the Southampton and Weymouth main line. Beyond Exeter, too, the various resorts are almost equally popular, whether reached by London and South Western or Great Western trains, or by means of both companies' services. But the intervening series of resorts, from Lyme Regis to Exmouth, afford less familiar ground, this portion of London and South Western territory being often overlooked in favour of more noted holiday and tourist centres further afield, or reached *viâ* the more southerly route through Southampton.

Yet the south-east corner of Devonshire has many attractions to offer, and the railways serving this area are in many ways particularly interesting. The country is systematically hilly, and this affords one reason for its scenic interest to the traveller, at the same time explaining the high standard of locomotive performance called for in operating the fast and heavy expresses which run over the Salisbury and Exeter main line. There is also the characteristic red sandstone formation, and the natural features peculiar to Dorset and Devon; and these attributes become even more noticeable as one leaves the main line to traverse one or other of the branch lines leading to those resorts which form our present subject-matter. The coast itself is equally interesting, with its sandstone cliffs, and here and there a chalk cliff by way of variety, wooded uplands and tortuous rivers, some of them companioned by the railway as they find their way towards the sea.



Photo] [*Basil Mercer.*

QUEEN STREET STATION, EXETER.
Bay used by Exmouth trains on the left.

Five sections of railway come within our purview. The first, from Axminster to Lyme

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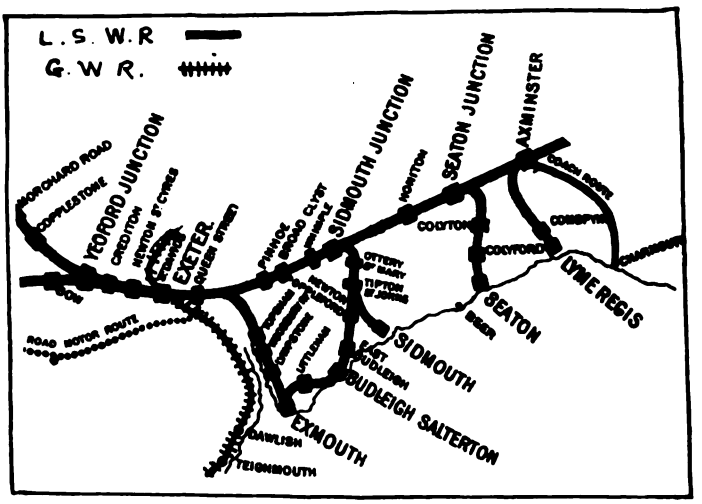


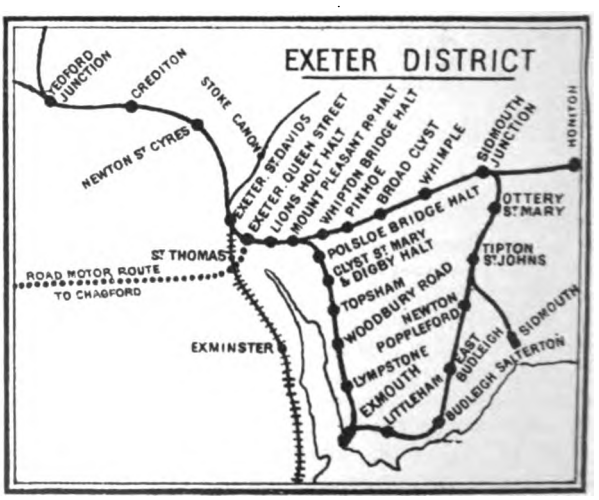
SKETCH MAP SHOWING RAILWAYS IN SOUTH-EAST DEVON AND THE LYME REGIS BRANCH.

Regis, is included as the train services to and from the old-fashioned watering-place of Lyme Regis are associated with the same facilities as the others to be considered, while if Lyme Regis is in Dorsetshire, the junction station for the branch, Axminster, is in Devonshire. Next, connected with the succeeding main line station, and ranking as the nearest Devonshire watering-place to London, is Seaton. Eleven-and-a-half miles beyond Seaton Junction is Sidmouth Junction, whence diverges the branch line to Sidmouth, and from this, at Tipton St. John's, extends the loop line through Budleigh Salterton to Exmouth, affording an alternative route to the favourite resort at the mouth of the Exe in place of the standard route from Exeter.

All the holiday resorts mentioned are highly esteemed by visitors desiring a holiday of a quieter kind, and those who reckon scenic, climatic and natural attractions as of greater value than splendid parades and promenades, bandstands and the like. It is true that Exmouth, Budleigh Salterton, Sidmouth, Seaton and Lyme Regis are by no means backward in their provision for modern ideas as to the proper equipment of a holiday resort; but it is done on a quieter scale, and the supply of adequate and high-class hotel, boarding-house and like accommodation, with good facilities in other ways, is the principal assistance given to nature, the magnificent and interesting coast and the beautiful inland scenery being otherwise allowed to constitute their own attractions.

Good railway facilities are given, at the periods when travel is principally favoured, by connections with important trains, sometimes with through carriages, so that the traveller is conveyed without inconvenience or delay *en route*, and the journey times are usually very creditable for the distances involved. Moreover, many of the connections are with restaurant car trains; and the rolling stock employed is in accordance with the high standard characteristic of the whole of the London and South Western system. There are also good holiday and period excursion arrangements amplifying the ordinary facilities.

Technically a light railway, the line from Axminster to the pretty little coast town of Lyme Regis is the newest of all the branches which now call for consideration. It was opened for traffic on August 24th, 1903, having been constructed under the Light Railways Act. To make the line several interesting engineering works were involved, owing to the presence of a chain of hills on the inland side of Lyme Regis. At Axminster the branch starts from a



ENLARGED MAP SHOWING RAILWAYS IN THE EXETER AND EXMOUTH DISTRICT.

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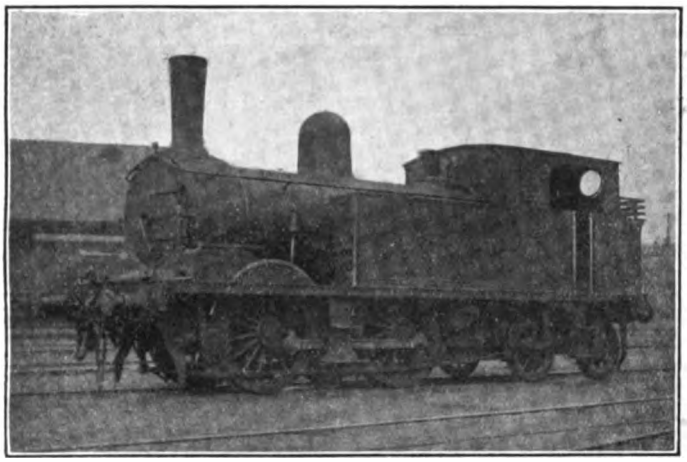

Photo] [*H. L. Hopwood.*

ADAMS' 0-4-4 TANK ENGINE (4 FT. 10 IN. CLASS) WORKING THE SIDMOUTH BRANCH.

It is now fitted, however, with the Drummond chimney and other details.

bay on the up side of the station, and then, rising at 1 in 80, crosses the main line by an overhead girder bridge. There is also a direct connection on the down side for goods traffic. Nearly all the way to Combpyne station, 4¼ miles from Axminster and about a mile from the coast, the line ascends, largely at 1 in 40. The railway then turns eastwards, descending at 1 in 40 for over a mile of the remaining 2¼ miles to the terminus, which is located 500 ft. above sea-level, and therefore on the inland side of the town owing to the virtual impossibility of bringing the line to the coast itself. The station is, however, very conveniently situated, and less than 10 minutes' walk is sufficient to bring the visitor right on to the "sea front." Approaching the station, owing to its high location, a magnificent view can be obtained, including the coast all the way to Portland, as well as the beautiful hill and woodland scenery characteristic of this part of the country.

Before reaching the terminus the Cannington Viaduct is crossed. There are 11 arches, constructed of concrete, and affording a fine example of this method of erection. The branch is single-track, and is at present worked by an Adams 4–4–2 tank engine, making 8 or 10 journeys each way daily, according to the time of year. A journey over this branch gives splendid views in many places.

Long before it was provided with railway communication, Lyme Regis was in considerable favour. It is, in fact, an old-world watering place, roused into activity by modern ideas and a happy hunting-ground for the geologist, historian, painter, photographer, and many others. Pleasure steamers from Weymouth, Bournemouth and Exmouth call on their coast trips from June to September. Lyme also possesses picturesque golf links and tennis courts. During the season regattas, aquatic sports, and flower shows are included in the programme of local events. Lyme Regis has additional charm in its noted Ware Cliffs, upon which the visitor may ramble for miles. The noted landslip is within easy walking distance, or train may be taken to Combpyne, the next station, and thence to the landslip. An omnibus which formerly ran from Charmouth to Axminster now connects Charmouth and Lyme Regis, and adds to the pleasures of a holiday spent in the district.

The next station beyond Axminster along the main line is Seaton Junction, one of those stations which have obtained their designation on the old-time basis of the destination of the branch put off therefrom. The branch was opened for traffic March 16th, 1868, and is a standard line, with 9 or 10 services each way daily. In common with the Axminster-Lyme Regis line, there are no trains on Sundays. The connection at Seaton Junction is a reversed one; that is, trains starting from the bay have to back out on to a terminal spur, thence diverging to the branch proper. Returning, they back into the passenger station.

Although only four miles long, a journey down this little branch line reveals many beauties, as it follows the course of the River Axe. The branch involves severe gradients, as the line eventually finds its way direct to the shore within a few yards of the beach. For some distance the line is directly alongside the river, and close to the railway station the Axe enters the sea. The climate of Seaton differs somewhat from that of neighbouring seaside places. It is cool in summer and warm in winter, yet the place is more open than Sidmouth, and

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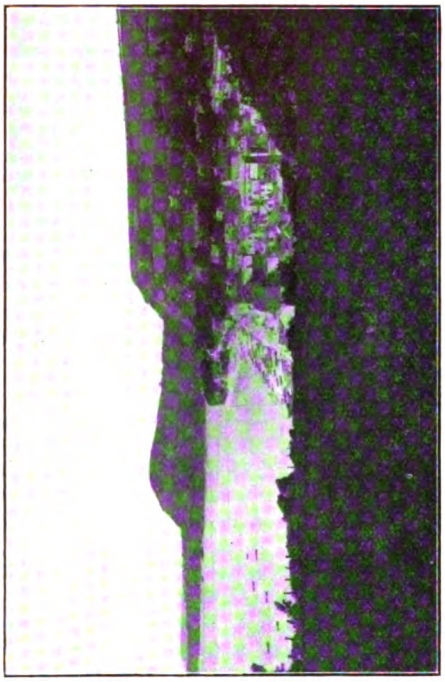
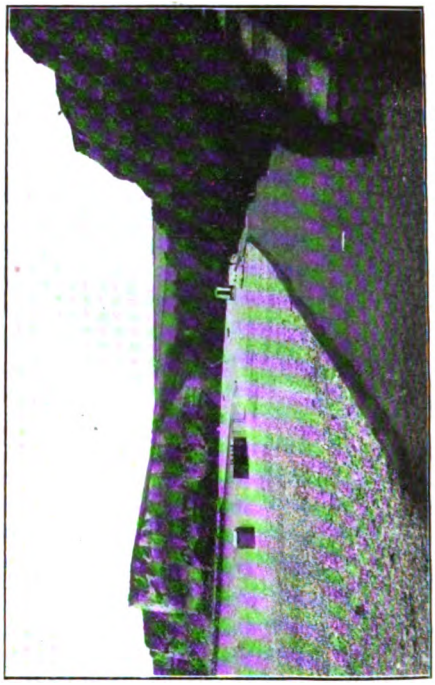
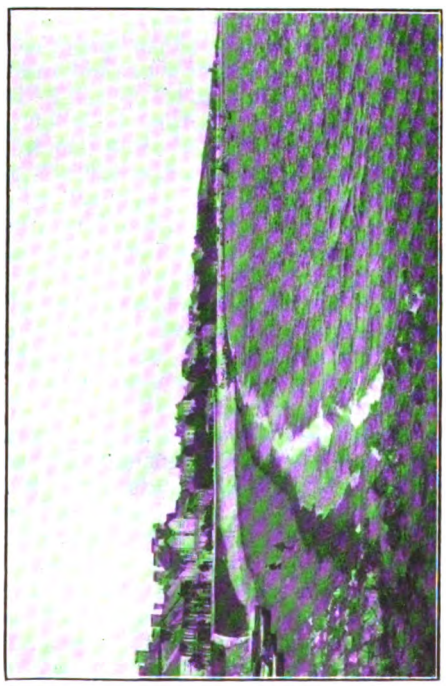


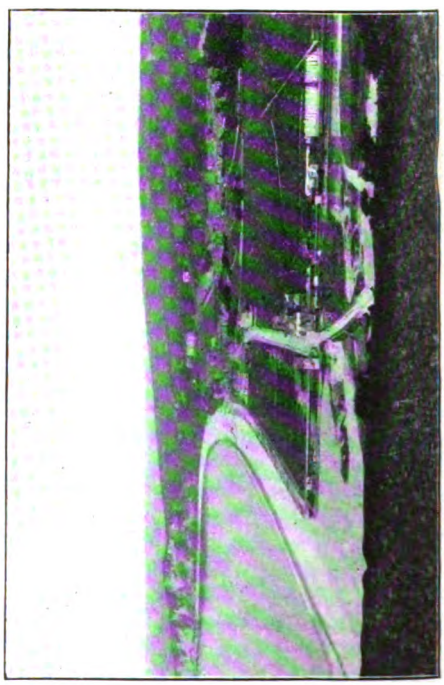
SIDMOUTH.



BATHING BEACH AND WHITE CLIFF, SEATON.



EXMOUTH.



SEATON, WITH RAILWAY STATION IN MIDDLE DISTANCE.

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thus appeals to those who do not desire too relaxing conditions. Across the river, on Haven Cliff, are laid golf links. Further along is the scene of the remarkable landslip, which excited intense interest throughout the country in 1839.

It is now necessary to travel along the main line, passing the interesting old market town of Honiton—famous as a centre for the lace industry of the district—and incidentally, from the railway point of view, climbing the famous Honiton bank to the tunnel, and thence descending on the other side to Sidmouth Junction. Like the junction at Seaton, the station justifies itself mainly as affording means of connection with the branch services; but it is also favoured in that several of the principal expresses call, in some instances to attach or detach through vehicles to or from London. There is a bay platform for branch trains, though one or two are continued through to Exeter and therefore use the main line platforms. The junction is made towards Exeter, as regards the direction of the rail connections. Adjacent is the goods yard, and the branch curves away rapidly, becoming single track, passing down the valley of the Otter to Ottery St. Mary station—adapted for crossing trains—thence continuing to Tipton St. John's. This is the junction for the Budleigh Salterton line, but is an ordinary two platform station, with sidings where the connecting trains can be reversed or placed. Immediately south of the station the two lines divide into two single lines, one, which from the platforms can be seen rapidly ascending a steep incline straight ahead, for Sidmouth, the other curving away to the west and substantially on the level, for some distance at any rate.

From Sidmouth Junction to Tipton St. John's there is no great scenic interest, but beyond the latter station, as the Sidmouth train begins its long climb of about 2 miles at 1 in 45, rising so as to overlook the Budleigh Salterton line, and then curving away, on embankment or in cutting, as it traverses Harpford Woods, the railway journey is quite a revelation to the traveller. The final stage involves a descent at 1 in 54, but only for about a mile. The station is a usual country terminal with one main platform adjacent to the station buildings and a bay for auxiliary traffic, besides goods yard, goods warehouse (with ivy-clad walls), horse dock, small turntable (tank engines only are, however, used on this section), and other necessary equipment.

The station suffers somewhat from being nearly a mile from the sea, but it is a pleasant walk or drive down. Sidmouth prides itself upon associations with the late Queen Victoria in her girlhood, and there is a stained glass window in the Parish Church presented by her to the memory of her father. King Edward also visited Woodbrook Cottage, now known as "Royal Glen," on one occasion. But it is on its own account that Sidmouth is principally favoured, as a centre for exploring the neighbouring country, and for its sheltered position and health-giving properties.

Returning to Tipton St. John's the Exmouth line may now be followed. Almost all the way to Budleigh Salterton the River Otter is followed, sometimes on one side of the line, then on the other, but while it makes attempts at creating scenic interest, it is not very successful, suggesting as a rule a somewhat insignificant stream with meandering proclivities. Both Newton Poppleford and East Budleigh stations are single platform erections without crossing arrangements. Before reaching Budleigh Salterton station steep grades are encountered, and the journey becomes scenically interesting, and continues so most of the way to Exmouth.

East Budleigh is associated with Sir Walter Raleigh. Near by is the house where he was born, and in the churchyard of the parish church is the tomb of his father's first wife, characterised by the peculiarity that the letters of the inscription—in Latin—are upside down, but reading, in that position, from left to right, as usual, so that wrong placing of the stone does not explain the reason for this queer result.

East Budleigh is a convenient station for several places of interest in the district, but it is at Budleigh Salterton that the coast is first actually reached, though even there the sea cannot be seen from the train. Here is a pretty modern two-platform station. As a holiday resort, Budleigh Salterton is a place of comparatively recent growth, and is now in very considerable favour, as it not only has notable attractions of its own, but is a good centre for visiting other resorts adjacent. The town has a peculiar feature, in that the main street, which slopes gently from Knowle Hill down to the sea, is bordered by a small stream, with tiny bridges here and there giving access to the houses on the other side. There is a good sea front, with cliffs beyond, from which fine views are obtained. Adequate provision is made for

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Photo] [*Basil Mercer.*

SEATON STATION (INTERIOR).

boating, bathing, fishing, golfing, and other holiday attractions.

Turning inland again, the line proceeds, with fairly steep gradients in places, to Littleham, and then, by means of a curve and an interesting viaduct, enters Exmouth, joining the line for Exeter close to the waterside as it approaches the terminus. Exmouth station is placed right alongside the river bank, and from it one obtains splendid views across the Exe, which is here of considerable width, of Dawlish and resorts on the opposite coast. The station has a main and a bay platform, with an all-over roof, protected for part of its length by a wind-screen on the seaward side. It is now treated as a closed station, non-passengers being admitted by means of platform tickets sold by coinfreed machines supplied by the British Automatic Co., Ltd.

The town itself is of considerable extent, and is claimed to be the equal of Torquay in many respects. It has two faces, towards the Exe, and towards the sea beyond the promonitory upon which it stands; and it is in many ways an up-to-date seaside resort, its closeness to Exeter causing it to be a favourite place for short visits, while many business men reside at Exmouth and travel into Exeter daily. There is a good promenade and sea front, and a pier, so that it possesses more of the "advantages" which are now considered by many people to be essential to a modern seaside resort than its neighbours. At the same time it is relatively quiet, and its popular features are not too obtrusive.

The railway journey from Exmouth to Exeter is interesting in that all the way to Topsham the line keeps close to the margin of the water. Across the river Great Western trains on their way to or from Dawlish and Teignmouth can be seen, so that on both banks the Exe is bordered by railway for several miles. It is one single-line section from Exmouth to Topsham, but is double-track onwards to the junction with the main line at Exmouth Junction, about a mile before reaching Queen Street station, where a bay is reserved for the Exmouth trains. Between Topsham and Exeter the service is amplified by rail motor cars and motor trains.

The Sidmouth and Exmouth services are operated in conjunction as far as train and engine working is concerned. From Exeter to Exmouth 6 or 7 bogie coaches will be used, and three of these are usually taken out again to follow the Budleigh Salterton route to Tipton St. John's, these connecting with the Sidmouth trains to Sidmouth Junction. Variations are, however, made in that some of the trains from or to Exeter have no Budleigh Salterton portions, a connecting train being run instead, while a

Photo] [*Basil Mercer.*

SEATON STATION (EXTERIOR).

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Budleigh Salterton train may continue through to Sidmouth Junction, or even back to Exeter *viâ* the main line. Most of the trains are constituted by modern bogie coaches, and the engines used are mainly of Mr. Adams' 0-4-4 class with 4 ft. 10 in. coupled wheels, in view of the steep gradients involved.

Photo. [*Basil Mercer.*

LYME REGIS STATION.

In conclusion reference may be made to the principal train services from London. Bearing in mind that for these places the usual times of travel are in the morning, not too early, and in the afternoon, the facilities are good. By the 8.50 a.m. from Waterloo an arrival at Exmouth at 1.57 p.m. is given, but none of the other places are served. The 11.0 a.m. is the principal train. This is non-stop to Salisbury, and thence to Sidmouth Junction, with through coaches to Sidmouth (arr. 2.32 p.m.) and a good connection for Budleigh Salterton, (arr. 2.40 p.m.) and Exmouth (2.54 p.m.) *viâ* Tipton, St. Johns. Through vehicles are also run from London as far as Salisbury and then taken on by a following slow train, giving connections for the Lyme Regis (arr. 3.30 p.m.) and Seaton (arr. 3.29 p.m.) branches In summer when the 11.0 a.m. train is replaced by the 10.50, 11.0 and 11.10 a.m. expresses, the Sidmouth vehicles are taken by the first train, while passengers for Lyme Regis and Seaton can use the last portion. The 1.0 p.m. train, or the 12.50 p.m. summer relief express, serves all places mentioned, with arrivals between 5.39 p.m. at Sidmouth, and Lyme Regis at 6.10 p.m., while the 3.30 p.m. gives arrivals between 7.3 p.m. at Exmouth and 7.55 p.m. at Sidmouth. There is only one down service on Sundays, the 12.30 p.m., which conveys passengers to Exmouth, due at 5.1 p.m. All these trains have restaurant cars for a portion or the whole of the main line journey.

Returning, passengers can leave Lyme Regis at 7.2 a.m. and Seaton at 7.10 a.m., and reach Waterloo at 11.3 a.m., while the 2.17 p.m. train into London serves all places with departures between 9.28 a.m. at Lyme Regis, and 10.0 a.m. at Sidmouth. From Exmouth at 11.15, Budleigh Salterton at 11.34 and Sidmouth at 11.45 a.m., passengers reach Waterloo at 3.25 p.m., while the 1.25 p.m. from Exmouth, with corresponding departures about the same time from other places, is due in London at 6.5 p.m. Between 3.20 and 3.55 p.m. there is another series of departures, reaching Waterloo at 8.7 p.m., while later connections, from 4.36 to 5.15 p.m. enable London to be reached at 10.34 p.m. On Sundays there are two services from Exmouth, but the principal is the 3.40 p.m., due at 8.30 p.m. at Waterloo. All these services, except the 6.5 p.m. into Waterloo, have restaurant car facilities.

The tourist ticket rates are very reasonable, and include break of journey facilities. They are as follows:

	1st.	2nd.	3rd.
Lyme Regis	43s. 0d.	27s. 6d.	24s. 3d.
Seaton	43s. 0d.	27s 9d.	24s. 3d.
Sidmouth	48s. 6d.	30s. 6d.	26s. 3d.
Budleigh Salterton	49s. 6d.	31s. 0d.	26s. 3d.
Exmouth	52s. 9d.	33s. 0d.	28s. 0d.

Excursions are also run weekly to suit various requirements. Holiday season tickets are issued during the summer applying to this district, so that a visitor to one place is able to visit neighbouring resorts at convenience and at moderate expense.

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How Scottish Railways Cater for the Clyde Residential and Holiday Traffic.

By J. F. GAIRNS.

PRINCES PIER, GREENOCK: GLASGOW AND SOUTH WESTERN RAILWAY.

IT is often claimed that the steamer services circulating along the Firth of Clyde provide the most remarkable example of such facilities in the world. This claim can hardly be disputed, especially when it is combined with the fact that most of the regular and systematic traffic is conveyed by steamers which are, in effect or actually, owned by railway companies, the private vessels also concerned plying mainly on special tourist routes.

In the Firth of Clyde, Scotland has one of the most wonderful pleasure grounds to be found anywhere, and that this is realised is shown by the magnitude and comprehensive character of the Clyde traffic. Here the Caledonian, Glasgow and South Western and North British Companies may be said to operate their steamer routes as extensions of their railway routes, operating on regular timetables in the same way as the trains, and depending for support largely upon the fact that time is kept on the water as rigidly as on land. Indeed, while notices appear in the timetables of the Caledonian and Glasgow and South Western Railways that in the event of certain long distance through carriages arriving too late to make the proper coast connection, they will be run special so as to catch the steamer concerned, it is taken for granted that the steamers will keep time and maintain land connections, except in the event of breakdown or extreme pressure of traffic, and then only to the same extent as similar conditions may produce unpunctuality on the railway.

Therefore we find the banks of the Clyde dotted with picturesque holiday resorts, many of them accommodating Glasgow business men who reside there throughout the year, or during the summer months, besides many others who remain for several weeks on end, travelling daily to and from Glasgow as season-ticket holders. Kirn, Dunoon, Innellan, Craigmore, Rothesay, Kilcreggan, Cove, Blairmore, Strone, Ardnadam, Kilmun, Millport, Kilchattan Bay, Brodick, Lamlash, Whiting Bay and a few other places are thus favoured, while in other cases there is a good deal of more or less systematic travel besides the purely holiday traffic, and the long distance touring routes which are mainly served by private vessels.

The Firth of Clyde as a holiday ground is unique in that, while adjacent to one of the busiest industrial districts in the world, it is characterised by wonderful scenery and a natural beauty which is unsurpassed. This fact has, no doubt, had much to do with the special favour afforded by the people of Glasgow and district for many decades; but is now becoming more and more generally realised by visitors from England and other parts of the United Kingdom. Long distance travel during the holiday season is in fact a steadily growing factor as Rothesay is a favourite place for holiday visitors to stay at, as it is a highly developed resort justifying its title of "The Queen of Watering Places" in many respects, and a convenient centre for touring the Firth in all directions; but Dunoon and other places also claim support of the same kind, and Greenock, Wemyss Bay, Craigendoran, Ardrossan, and other main land resorts are also adopted as headquarters, as they offer very similar facilities.

Northwards, the Firth branches into the Gareloch, Loch Long, Loch Goil and Holy Loch all vying with one another as claimants for magnificent scenery, with tree-clad slopes extending down to the

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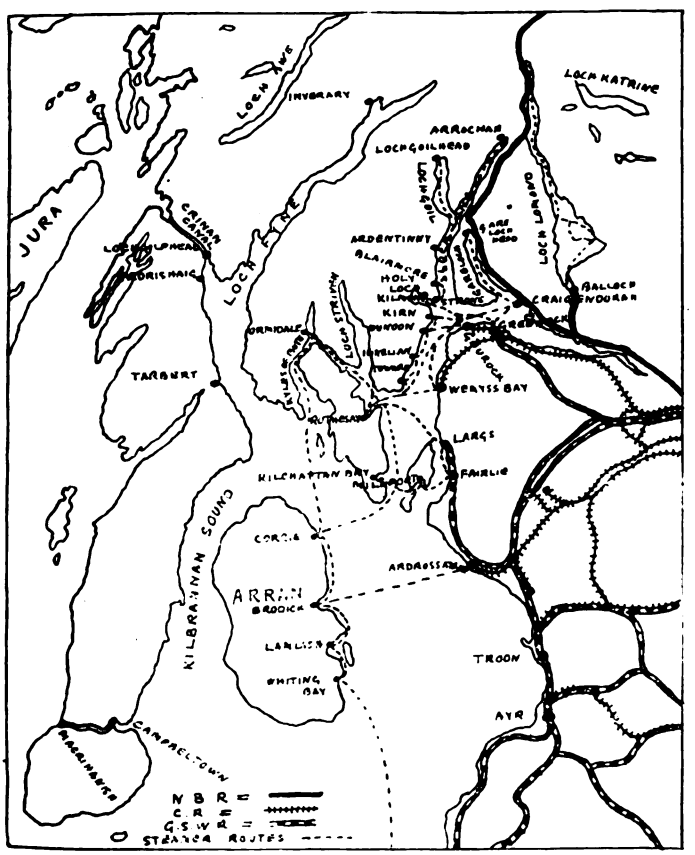
water edge, high ground behind, and splendid mountain views in the distance, yet sufficiently near to lend interest to inland walks and tours and coach or motor drives. Rothesay is conveniently adjacent to Loch Striven and the beautiful Kyles of Bute, with Loch Ridden to the north. To the south the Cumbraes and the southern end of the Island of Bute present favourable features, while Arran has special attractions of its own, including mountains of considerable height, and wonderful inland scenery. As regards longer routes, Ayr, Campbeltown and Loch Fyne provide further interest, and the latter leads by way of the Crinan Canal to the Sounds of Jura and the unique series of islands constituting the Hebrides. The main land, too, has its attractive features, and so we find many hundreds of miles of coast line served to the west exclusively, and to the east partially by steamer services, the whole providing traffic for what we have termed the most remarkable example of comprehensive and extensive steamboat facilities in the world.

West of the Ayrshire Coast and south of Oban, with the solitary exception of the Campbeltown and Macrihanish Light Railway and the Rothesay Tramways, there is not a mile of railway, although the inhabited and relatively populous area represents a very appreciable portion of Scotland; yet every place of importance is well served, and smaller places sufficiently served by means of the steamer facilities in question, supplemented as required on shore by private coach and carrier arrangements suited to requirements.

In earlier days the Clyde traffic was largely conveyed from Glasgow direct, and most of the private vessels still start from the Broomielaw, the quayside of Glasgow, and handy to the central districts of the town. The bulk of the ordinary traffic is, however, operated by the railway steamers, and these commence at the termination of one or other of the railway routes in connection. Indeed, in view of the fact that the railway services are arranged to give expeditious routes, and to run to timetables which are to be adhered to in the same way as the trains, this is a necessity. There are therefore four principal routes for the northern and central portion of the Firth of Clyde, and six for the southern section, and long distance routes in conjunction with private steamers.



SKETCH MAP SHOWING PRINCIPAL RAILWAY STEAMER ROUTES ON THE FIRTH OF CLYDE.

The North British route to Craigendoran follows the northern shore of the river, and is particularly convenient for the Gareloch, Loch Long and Loch Goil, though in point of time there is virtually nothing to choose between this route, and the Greenock and Gourock routes as regards Kirn, Dunoon, Innellan and Rothesay traffic. *Viâ* Princes Pier, Greenock, Glasgow and South Western Railway steamers serve routes north and south, and the same

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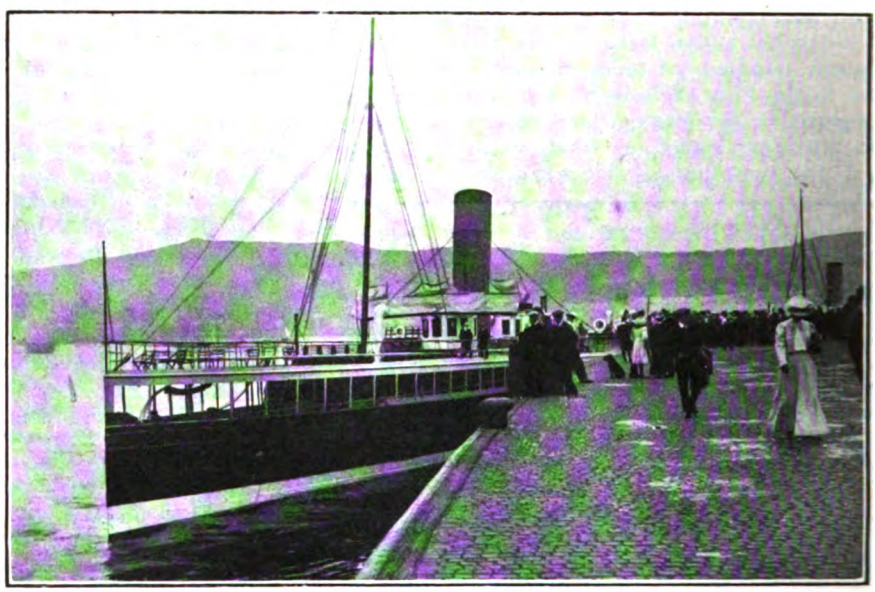
applies to Gourock and the Caledonian vessels. *Viâ* Wemyss Bay the Caledonian Railway offers special advantage in respect of the Rothesay traffic. To the south, Ardrossan is served both by Caledonian and Glasgow and South Western trains and steamers, and affords the quickest route to Arran, while Fairlie and Largs, with Troon and Ayr further south, are other centres for steamer traffic as well as places of interest on their own account.

Although each Company operates its own vessels—those of the Caledonian Railway are actually the vessels of the Caledonian Steam Packet Company—and there is considerable competition between them, and numerous other contributions reviewing particular phases, which have appeared at various periods. It will be sufficient, now, to deal with conditions as they are at present.

In the case of the Caledonian Steam Packet Company, eight vessels are engaged in the Clyde traffic, the

	Gross Tonnage.	Speed. knots.	Passenger Capacity.
Duchess of Argyll ..	740	21¾	1,713
Duchess of Hamilton ..	552	18	1,780
Duchess of Rothesay ..	384	17½	1,376
Duchess of Montrose ..	321	17	1,200
Duchess of Fife	321	17½	1,200
Marchioness of Lorne ..	294	15	1,213
Marchioness of Breadalbane	246	15	1,119
Caledonia	244	14	1,093



Photo] [*J. Taylor.*

CALEDONIAN RAILWAY STEAMER *Duchess of Hamilton* EMBARKING PASSENGERS AT GOUROCK PIER.

there is also a large element of co-operation, return tickets being in some cases interavailable, while in many instances passengers are able to change from one steamer to another so as to obtain full advantage of facilities offered, irrespective of individual ownership of vessels.

The story of the Clyde steamboat services is a fascinating one, but cannot be repeated here. Readers may be referred to the Caledonian Railway Diamond Jubilee Number of the RAILWAY MAGAZINE, September, 1907; the Glasgow and South Western Railway special number, April, 1911; an article published in August, 1902, dealing with Clyde Rail and Steamboat Traffic;

The *Duchess of Argyll* is a turbine steamer, all others being paddle vessels, though the *Duchess of Hamilton* has nearly the same dimensions and a slightly larger passenger capacity, though gross tonnage is considerably lower and its speed is less. The other vessels are also of considerable size. The *Caledonia* usually plies between Gourock and Kilmun, the *Marchioness of Breadalbane* between Wemyss Bay and Millport, and the *Marchioness of Lorne* between Wemyss Bay and Rothesay. The others are engaged on the longer routes and for the special services which constitute so important a factor in the Clyde steamer traffic.

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The following vessels are employed by the Glasgow and South Western Railway:

	Gross Tonnage.	Speed. knots.
Atalanta	486	17½
Glen Sannox	610	19
Juno	592	19
Jupiter	394	18½
Mercury	378	18
Neptune	378	18
Minerva	315	16½
Glen Rosa	306	16½
Mars	317	17½

Here also there is one turbine vessel, the *Atalanta*, the others being paddle steamers, all being of convenient dimensions for the traffic in question, and up-to-date as regards design and equipment. The *Glen Sannox* is employed almost exclusively between Ardrossan and Arran, the *Juno* on the Ayr, Troon and Ardrossan excursion services and the *Glen Rosa* between Fairlie, Millport, Kilchattan Bay, Largs and Rothesay. Most of the others ply to and from Greenock (Princes Pier), north or south, or on special tours.

The North British Company operates the following vessels on the Clyde.

	Gross Tonnage.	Speed. knots.
Waverley	448·52	19¼
Marmion	403·17	17
Kenilworth	332·99	18
Talisman	278·88	18
Dandie Dinmont	343·18	17
Lucy Ashton	224·47	16

The *Waverley* is the favourite vessel, comparing well with those operated by the Caledonian and Glasgow and South Western Railways. Others are somewhat smaller. All are paddle vessels.

To a large extent particular vessels are given definite routes and duties; but this arrangement is modified as required. A few notes as regards the principal and special routes, will be of interest, especially as this method will be particularly convenient for setting forth the special features of the traffic.

The *Jupiter* and the *Duchess of Hamilton* take special services during the summer months. The former vessel starts from the Glasgow and South Western Princes Pier, Greenock, at 9.10 a.m. (train from St. Enoch at 8.20 a.m.), calling at Gourock 9.25 a.m. (train from Glasgow Central, at 8.35 a.m.), Kirn, Dunoon, Wemyss Bay, 10.30 a.m. (train from Glasgow Central 9.30 a.m.), Craigmore and Rothesay (11 a.m.), thence traversing the beautiful Kyles of Bute, calling at Colintraive (on Wednesdays only), Tighnabruaich, thence passing to the west of the Island of Bute and crossing to the eastern side of Arran, serving Corrie, Brodick, Lamlash and King's Cross, terminating at Whiting Bay at 1.40 p.m. While passing along the shores of Arran, splendid views are had of Goat Fell and other mountains in Arran. The return

Photo] [*J. Taylor.*

CALEDONIAN RAILWAY.

Boat train at Gourock Station waiting for steamer connections.
Rebuilt Drummond locomotive No. 82.

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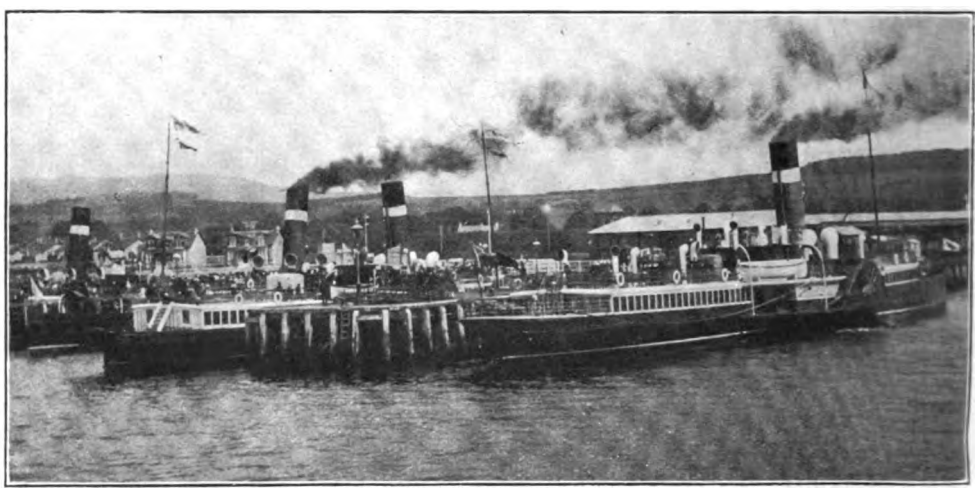
journey is commenced at 2 p.m., except on Saturdays; but is made direct from Arran to Craigmore and Rothesay (4.10 p.m.), with the same calls as on the outward journey to Gourock and Greenock, train arrivals in Glasgow being 6.30 p.m. *viâ* Wemyss Bay, 6.41 p.m. *viâ* Gourock and 6.38 p.m. *viâ* Princes Pier, Greenock. On Saturdays the steamer starts from Whiting Bay at 3.15 p.m. and is later throughout.

This tour occupies virtually a whole day in a way which is never devoid of interest; yet the return fare from Glasgow is only 5s. 3d. first class and cabin, 4s. third class and cabin, and 3s. 3d. third class and steerage.

On Tuesdays the *Duchess of Hamilton* leaves Gourock at 8.55 a.m. (train from Glasgow Central 7.40 a.m.), and serves Kirn, Dunoon, Innellan, Craigmore and Rothesay, thence following the mainland to Largs, serving Millport, touring round the Cumbraes and the Island of Bute, traversing the Kyles of Bute and entering Loch Ridden, Loch Striven, Loch Goil, and Loch Long, providing the most comprehensive tour undertaken by a single vessel on the Clyde. Passengers leaving Glasgow at 11 a.m. can join this vessel *viâ* Dunoon for the Loch Goil and Loch Long section of the tour, constituting a favourite afternoon trip. Returning passengers for Largs and Millport, change at Wemyss Bay, while passengers for Gourock change at Dunoon. Glasgow is reached at 6.30 p.m. *viâ* Wemyss Bay and 6.41 p.m. *viâ* Gourock. The return fares are 6s. (first and cabin), 5s. (third and cabin), and 4s. (third and steerage). On Mondays and Wednesdays this vessel follows practically the same route, and the tour is round Arran, while on Fridays it is round Ailsa Craig. On Thursdays a further variation is adopted, serving Lochranza (Arran) and Tarbert (Loch Fyne).

The Glasgow and South Western steamer, *Atalanta*, follows an interesting route from Greenock (Princes Pier) to Ayr *viâ* Dunoon, Rothesay, Largs and Millport.

On certain days the *Glen Sannox* is engaged in a special tour from Ardrossan at 10.7 a.m. round Arran, round Ailsa Craig, and to Ayr. By using the *Glen Sannox*, *Jupiter*, and the *Duchess of Argyll*, afternoon tours are occasionally arranged from Whiting Bay and other Arran resorts to Rothesay and back. Similar excursions can be made in the evening on certain dates from Arran to Rothesay, round Arran or to Lochranza, according to date, return fare one shilling.



GROUP OF NORTH BRITISH RAILWAY STEAMERS AT CRAIGENDORAN.

In the case of the North British Railway the *Waverley* makes a special tour from Craigendoran 12.20 p.m. (train from Glasgow, Queen St., at 11.35 a.m.), to Kirn, Dunoon, Rothesay and thence round the Island of Bute, while the *Marmion* makes another excursion from Craigendoran at 10.25 a.m. (Glasgow 9.35 a.m.), to Lochgoilhead and Arrochar. A popular tour (No. 5) is that from Glasgow to Arrochar in the morning, thence by coach to Tarbet, and returning

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PASSENGERS EMBARKING ON GLASGOW AND SOUTH WESTERN RAILWAY STEAMERS AT PRINCES PIER, GREENOCK.

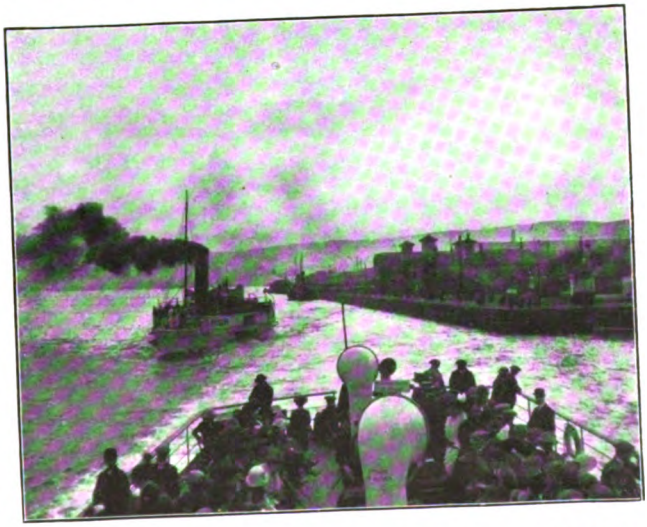
by Loch Lomond steamer to Balloch and back by rail.

All these are supplementary to the regular services maintained by various vessels from Craigendoran, Greenock (Princes Pier), Gourock and Wemyss Bay, and southward *viâ* Fairlie and *viâ* Ardrossan and other mainland ports to the numerous resorts dotting the shores of the Firth in all directions. Trains also run in connection with privately owned steamers, also with the long distance vessels such as those to Campbeltown, Oban, Inveraray and other special routes; while numerous coach, steamer and train connection round tours, and other facilities are also associated. In fact, examination of the booklets covering the Clyde arrangements published by the three railways concerned is a revelation to any one who has had no experience of the Clyde steamboat traffic and its attractions. In the ordinary way the traffic is heavy enough; at such times as the Glasgow Spring Holiday, the Glasgow Fair Holidays and other periods of special stress every vessel available has to be pressed into service. Yet the railways arrange to deal with the heavy pressure with very commendable punctuality and expedition.

As indicated to some extent also fares are extremely reasonable, but they are even more so if a steamer season ticket is taken out. For 12s. 6d. weekly (8 days), or 20s. for a fortnight (with 2s. 6d. deposit) a season ticket can be had available on all the Caledonian, Glasgow and South Western and North British steamers on the Firth of Clyde, and this includes all the regular and excursion sailings advertised. Needless to say, there are not many visitors to Clyde resorts who fail to avail themselves of this privilege.

All the vessels are provided with well furnished saloons, where breakfast, lunch, tea and light refreshments can be had at very reasonable prices. For 3s. coupons covering dinner (equivalent to full luncheon in the south) and plain tea are issued.

The railway services in connection with the steamers are all of a favourable character. As a rule the trains are express or fast from Glasgow, whatever route is followed, and at many periods there are alternatives, suggestive of competition, but more correctly designed to meet the demands of the respective routes and of the traffic involved. Indeed, on Saturdays there are several instances of duplicate trains leaving the same terminus within a few minutes, so heavy and comprehensive is the traffic.



STEAMERS LEAVING PRINCES PIER, GREENOCK, FOR DUNOON AND ROTHESAY.

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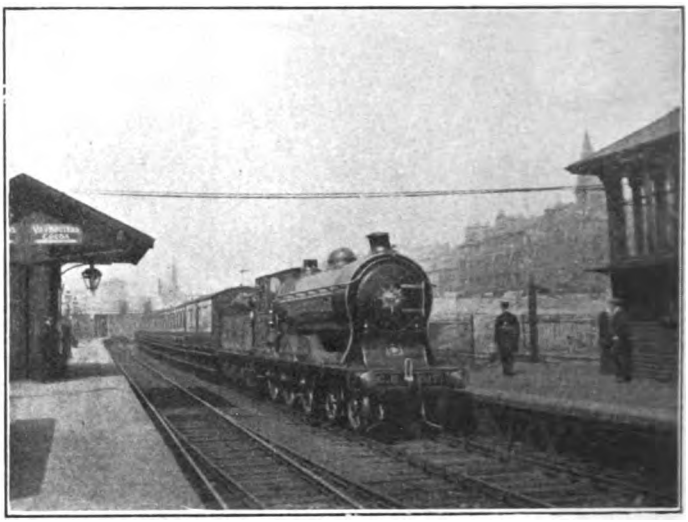
At the same time, excessive loading is mainly confined to periods of special stress, and the aim of the companies is to provide adequate and sufficient accommodation, so that as a rule passengers can travel both by train and by steamer in comfort so as to obtain full enjoyment of the unique facilities offered.

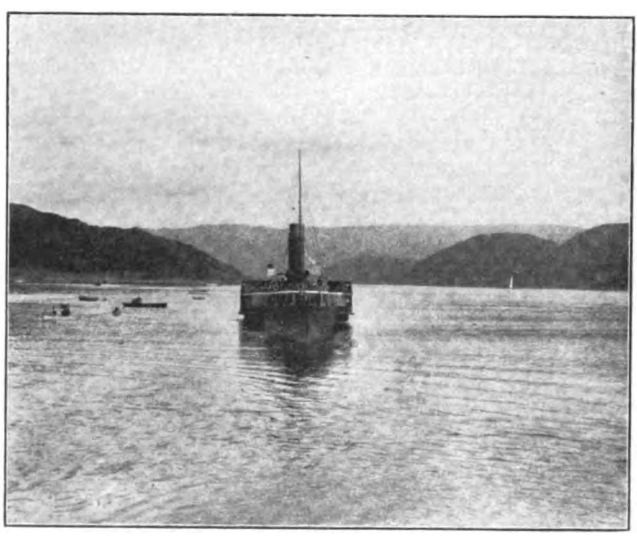
From Ardrossan and southern ports, steamers also ply to the Isle of Man, Belfast, Portrush and other special routes, and these also are in considerable favour, though the railways are only concerned as regards trains in connection, combined and alternative routes and special facilities associated therewith.



Photo] [*D. L. C. Evans.*

CALEDONIAN RAILWAY.

Ardrossan boat express passing Eglinton Street.



GLASGOW AND SOUTH WESTERN RAILWAY STEAMER *Mercury* IN THE KYLES OF BUTE.

To fully appreciate what the Clyde has to offer personal experience is necessary, but for long distance visitors, good provision is made. Weekend, tourist and excursion facilities from London and other centres are issued to serve the Clyde resorts, and through vehicles to Gourock, Ardrossan, etc., are provided in a few instances. The bulk of the traffic is conveyed, however, in trains from Glasgow stations, St. Enoch, Central or Queen St., with a proportion in through trains or vehicles from Edinburgh. The train services in connection with steamers are very complete indeed, and a study thereof is full of interest; but space will not permit of elaboration on this occasion and consideration must therefore be left for another time.

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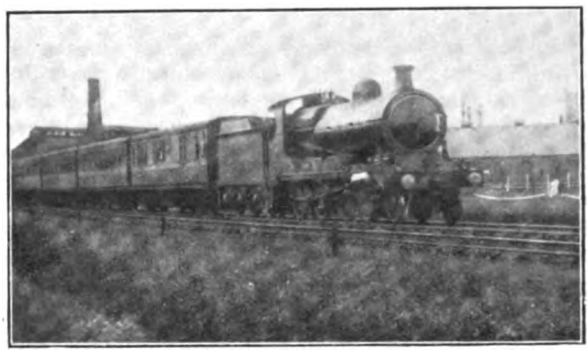
From Anywhere to Anywhere by the Great Central Railway.



Photo] [*J. N. Woodcock.*

A SPECIAL GREAT CENTRAL TRAIN ON THE NORTH EASTERN RAILWAY.

North Eastern Railway 4-6-0 locomotive No. 1111.

SPEAKING generally, most of the leading railways in the United Kingdom suggest their sphere of influence by their titles; but in the case of the Great Central Railway, the name adopted in 1897 is not only peculiarly applicable, but may also be interpreted in the sense that "Central" carries with it the suggestion of close association with all its neighbours, and of being central also in respect of traffic facilities extending from and to its own system in all directions. At least, that idea appears to be the one which has governed Great Central development ever since the Manchester, Sheffield and Lincolnshire Railway emerged from its relative provincial obscurity to take its place as one of the great English trunk lines. And in process of development the quandom cross-country railway has extended its tentacles, in association with various neighbouring lines, until it has become a principal factor in what is, perhaps, the most remarkable series of special train services and through carriage and through working arrangements in the Kingdom. Indeed, while a title such as that adopted above must be interpreted with reasonable limitations, it is, at least, as justifiable in this connection as in any other; and as such may be accepted as indicating the realisation of one feature which has characterised the policy of the management of the Great Central Railway for many years past.

In the RAILWAY MAGAZINE for December, 1913, the principal features of the winter arrangements as regards through trains and through carriages were briefly reviewed. It was then pointed out that several of the principal cross-country services include the peculiarity that neither starting nor destination station is located upon the Great Central Railway, this line being the connecting link, though the Great Central Railway has, in some instances, been the prime mover in respect of the introduction of such special facilities, and provides its share or the whole, of the rolling stock employed.

Even in winter Great Central vehicles, or vehicles of other companies used on the through services in question, reach Bournemouth, Southampton, Cardiff, Swansea, Barry, Bristol and other places in the south and south-west; Harwich, Hull, Yarmouth, Grimsby and Cleethorpes on the east; and Huddersfield, Bradford, Halifax, York, Newcastle-on-Tyne and other places to the north and north-west. In summer, all these connections and facilities are maintained, and many others added, including Aberystwyth, Blackpool, Ilfracombe, Lowestoft and Scarborough—places which represent very considerable wanderings from the Great Central system proper.

It must also be remembered that at York, Manchester, Liverpool, Wrexham, Lincoln, Norwich, Bradford, Bristol, Cardiff Gloucester, Oxford, Basingstoke, and other centres, the Great Central Railway is brought into more or less direct association with the train services of many other railway companies, the through train and through carriage arrangements afforded to these places affording convenient connections with trains running to or from almost any part of England, Wales or Scotland, while Ireland and the Isle of Man are conveniently accessible *viâ* Liverpool.

Thus, by its own special arrangements, it is possible to travel without change of carriages between places which are widely

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separated and one or both of which may be many miles away from Great Central metals; while by making a single change even this extensive area is very greatly extended.

For completeness the standard services may be again reviewed as follows:—

(1) Barry Docks (9.44 a.m.) to Newcastle-on-Tyne (6.47 p.m.) *viâ* Cardiff, Newport Gloucester, Cheltenham, Banbury, Leicester, Nottingham, Sheffield, York and Darlington. Return from Newcastle-on-Tyne at 9.20 a.m. Special rolling stock, with luncheon and tea cars and vestibuled corridor carriages, is employed. The unusual route of this train gives it an exceptional value, as it enables many towns to be reached conveniently which would otherwise involve relatively involved journeys.

(2) Manchester (8.20 a.m.), Huddersfield (8.18 a.m.), and Halifax (7.47 a.m.), *viâ* Sheffield, Nottingham, Leicester, Banbury, Oxford, Bath and Bristol (arrive 2.39 p.m.). Restaurant car express. The return train leaves Bristol at 3.56 p.m.

(3) Manchester (10 a.m.), York (10.23 a.m.), and Bradford (10 a.m.), luncheon car express for Oxford, Southampton and Bournemouth.

(4) York (2.55 p.m.) to Oxford, Winchester and Southampton.

(5) York (10 p.m.) to Oxford and Bristol.

(6) Sunday trains between Sheffield and Cardiff and Swansea.

(7) Several shorter journey trains, such as the 9 a.m. service from Oxford to York, Southampton to Woodford and Hinton, affording connections between other systems *viâ* Woodford and Hinton and Banbury.

(8) London, Huddersfield and Bradford special restaurant car trains.

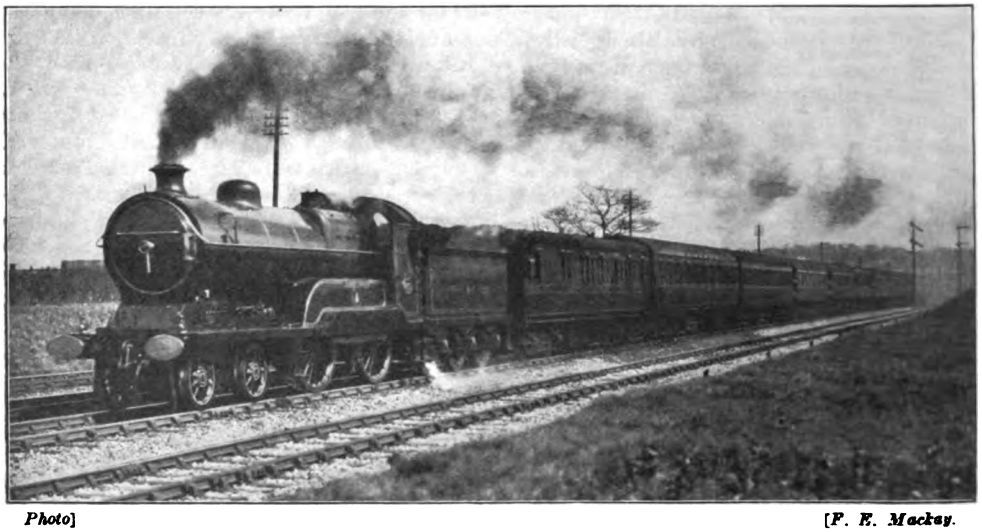
(9) London to Grimsby and Cleethorpes by slip vehicles from the 3.15 p.m. "Sheffield Special."

(10) Manchester and Sheffield to King's Cross.

(11) Liverpool and Manchester to Harwich, *viâ* Sheffield and Lincoln.

(12) Through trains to and from Liverpool, Manchester, and Sheffield to Hull.

(13) Manchester and Sheffield to Norwich and Yarmouth.



Photo] [*F. E. Mackay.*

GREAT CENTRAL RAILWAY.

"Restall" Excursion train for Leicester, Nottingham and Sheffield.
4-4-0 locomotive No. 430 *Purdon Viccars.*

(14) The Great Central Railway's own routes to Cleethorpes, Grimsby, Lincoln, and various shorter services such as those between Sheffield and York and other places.

These are more or less usual services, and apply all the year round, except that in summer they are amplified. During July, August and September others are added.

One of the most interesting is that to Blackpool. This is described as a tourist express, and runs on Mondays, Tuesdays, Fridays and Saturdays, starting from Leicester at 8.5 a.m. and serving Nottingham, Chesterfield, Sheffield, Penistone, and a few other stations, eventually reaching

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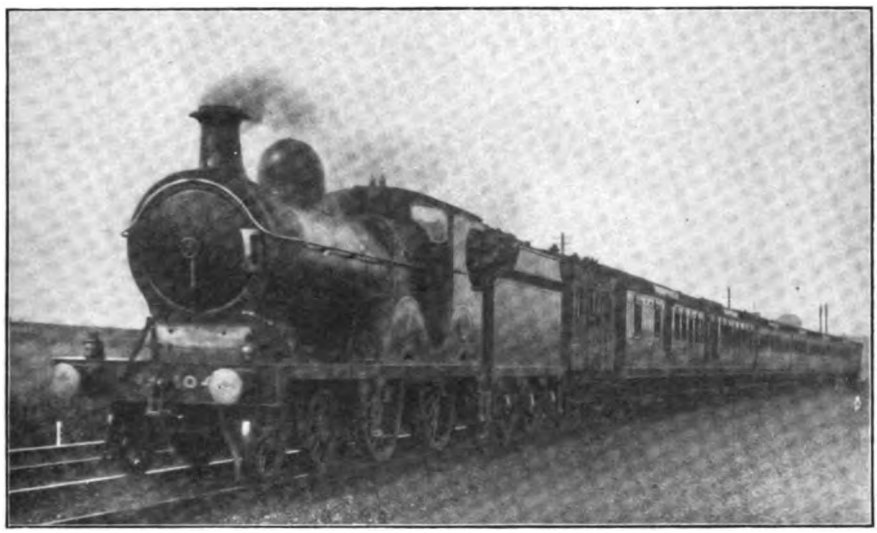
Blackpool (Talbot Road) at 12.52 p.m., by no means an insignificant schedule. The return train leaves Talbot Road station at 2.7 p.m. and reaches Leicester at 7.6 p.m. Through tickets are also issued by other services, either by using connections, or involving a change of stations at Manchester.

The next is really an extension of No. 2 above, through carriages going right away to Ilfracombe, serving Taunton and the Great Western system even more conveniently than *viâ* Bristol, the winter terminus.

Another summer development is a through tourist express from Sheffield to Aberystwyth *viâ* Manchester (Central) and Wrexham. In summer the through carriage



Photo] [*W. Bradshaw.*

NEWCASTLE-ON-TYNE—BARRY DOCKS RESTAURANT CAR TRAIN (GREAT WESTERN STOCK), NEAR LEICESTER.

4-4-0 locomotive No. 1041.

from the Great Central system to Yarmouth, Great Eastern Railway, is replaced by a special luncheon car corridor express, from Liverpool to both Yarmouth and Lowestoft and from Manchester to Yarmouth, leaving Liverpool at 11.10 a.m., Manchester (London Road) at 12 noon, Sheffield at 1.21 p.m., Yarmouth (Vauxhall) is reached at 5.55 p.m. and Lowestoft at 6.5 p.m. The return service leaves Yarmouth at 12.12 p.m. and Lowestoft at 12 noon.

What all these facilities mean in the aggregate is well shown by examination of a map of the Great Central Railway and its connections, and if regard is had to which portions of a journey are on Great Central metals and which *viâ* other companies' lines, the remarkable extent to which the Great Central Railway justifies its character as a railway for journeys from almost anywhere to anywhere is emphasised perhaps more strongly than any lengthy dissertation or comprehensive list of place names can do.

In conjunction with these facilities through, week-end, tourist and other usual tickets are issued, in most cases with comprehensive break of journey facilities. It is also characteristic of Great Central policy that in most instances excursion and other tickets which are usually limited more or less seriously, are available by the principal express trains, including those equipped with restaurant cars and special corridor, lavatory and vestibuled rolling stock of the most up-to-date designs. In fact, as a rule, the only restriction is that the tickets must be used as arranged, by specific trains on dates advertised, and without break of journey facilities except in particular instances. What this means in the case of the Blackpool, Scarborough, Cleethorpes, Aberystwyth, Isle of Man, and other favourite services will be obvious to the traveller who is usually compelled, from notives of economy of otherwise, to depend upon excursion and other cheap ticket arrangements, in order to keep

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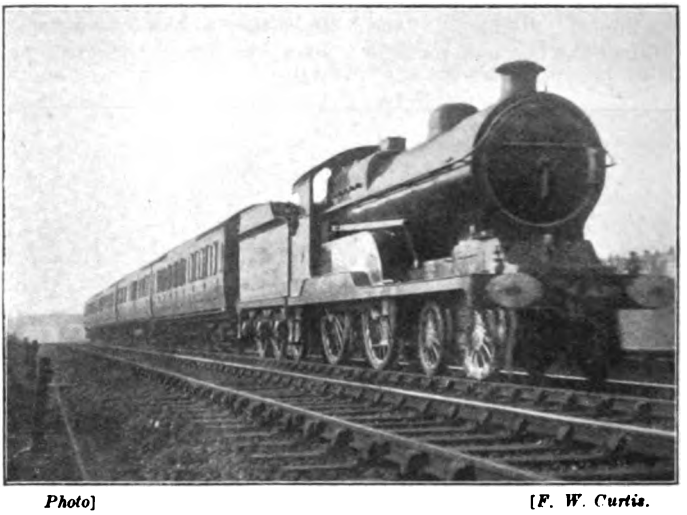
the expense of a holiday within reasonable limits. Such facilities also apply beyond the Great Central system, and considerably beyond the through train and through carriage arrangements, covering almost the whole of the English Coast, as well as Scotland, Wales and Ireland. Such arrangements apply also to places of interest such as Harrogate, Derbyshire the Peak District, the Lake District, the Welsh and Westmorland mountains, Staffordshire and other inland resorts, as well as to the favourite centres along the coast.

There are also the Continental arrangements, a comprehensive theme on its own account. This traffic is now a very considerable factor in view of the favourable facilities, modern steamers and the numerous tours available in Holland, Belgium and Germany and other Continental countries.



Photo] [*F. W. Curtis.*

GREAT CENTRAL RAILWAY:

Sheffield—Marylebone Restaurant Car Express 4-4-0 Locomotive (Robinson Superheater). No. 429 *Sir Alexander Henderson.*

Railway Statistics of the United States of America.

This annual publication, prepared by the Slason Thompson Bureau of Railway News and Statistics, and applying to the year ending June 30th, 1913, is a comparison with the official reports for 1911 and recent statistics of foreign railways. Its scope is comprehensive, and the foreign comparison of two decades of railway progress may be extracted:

	1893.	1903.	1913.
Population	66,349,000	80,848,557	97,337,000
Miles of Line	169,779	205,313	242,177
Miles of track	221,863	283,821	367,658
Passengers carried	593,560,000	694,891,000	1,018,283,000
Average passengers per train	42	46	57
Freight tons carried	745,119,000	1,394,394,000	2,009,862,000
Average tons per train	184	310	469
Number of Locomotives	34,788	43,871	63,198
Passenger cars	31,384	38,140	50,849
Freight cars	1,013,307	1,653,782	2,260,495
Employés	873,602	1,312,537	1,814,047

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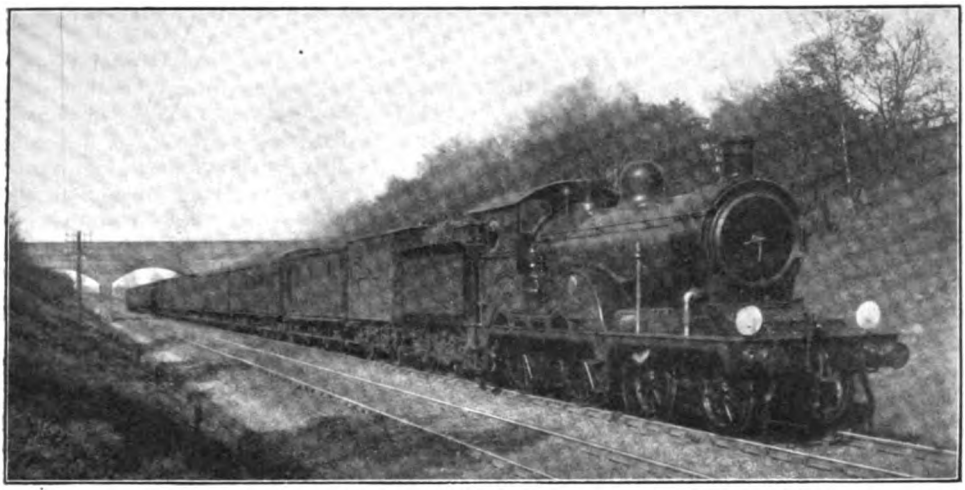

Photo] [*H. T. Worlock.*

GREAT EASTERN RAILWAY.

Up Yarmouth express near Shenfield, 4-4-0 locomotive No. 1874.

Special Facilities on the Great Eastern Railway.

IN some respects the Great Eastern Railway may be considered a "monopolist" system, seeing that, except for the Midland and Great Northern Joint Railway, it serves virtually the whole area known as East Anglia, in many cases without rail competition whatever. Thus, following the coast northwards from the mouth of the Thames, beyond Southend, it is the only railway to Burnham-on-Crouch, Maldon, Tollesbury (the Kelvedon and Tollesbury Light Railway, worked by the Great Eastern), Brightlingsea, Clacton-on-Sea, Frinton-on-Sea, Walton-on-the-Naze, Harwich, Dovercourt Bay, Felixstowe, Aldeburgh, Southwold and Hunstanton; while from London, as well as for traffic in many other directions, it affords the principal and usual routes to Lowestoft, Yarmouth, Cromer, Mundesley and Sheringham.

Yet in no respect is there any suggestion of "monopolist" methods. Indeed, the Great Eastern Railway has developed a system of facilities which has become characteristic. To some extent similar or corresponding arrangements are also made by other companies, but in the case of the Great Eastern Railway many of these special facilities have been largely responsible for the creation of the exceptional East Coast holiday traffic, and cause the Great Eastern to rank as one of the principal seaside and holiday lines in the Kingdom.

Many of the East Anglian resorts are within easy distance of London, hence their favour, apart from their own attractions and conveniences with family parties; but it also follows that many business men find it convenient to run up to town and back again once or several times during a holiday, and for their benefit generous arrangements are made.

A holiday is to be spent, say, at Clacton-on-Sea. No matter what the day of the week, fortnightly tickets can be obtained at the rate of 17s. 6d. first class and 10s. third class for each adult from London. Any train can be used, including the special tea car train from Liverpool Street at 5.6 p.m., other trains giving restaurant car accommodation as far as Colchester, and the Saturday midnight supper car express. This ticket is available for return at any time within 15 days, by all advertised trains, including the special breakfast car express from Clacton-on-Sea at 7.2 a.m.

These fortnightly tickets are also issued at all suburban stations, the journey to and from Stratford or Liverpool Street to connect with the fast trains being included at the same fare. Similar tickets are issued from the principal country stations and where

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such is not the case through tickets can be obtained on giving 24 hours' notice, with a small supplemental fare. These tickets, too, can be used to a limited extent at alternative stations. Thus a Clacton-on-Sea fortnightly ticket can be used for return from Frinton-on-Sea, Walton-on-the-Naze, Brightlingsea, Harwich or Dovercourt Bay.

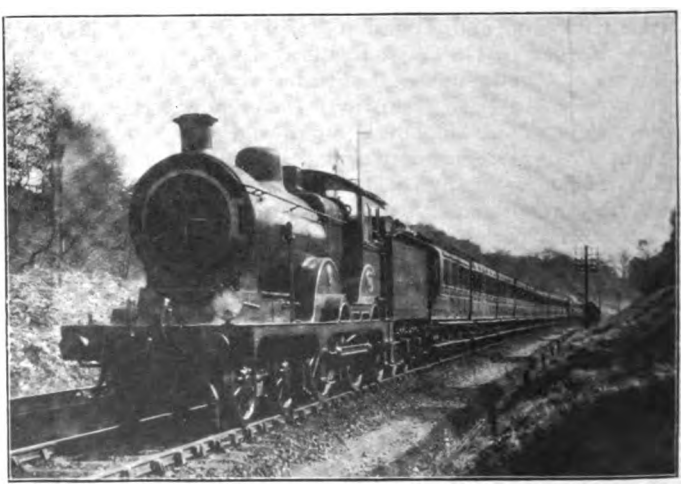
If a longer stay than 15 days is desired, the usual tourist arrangements come into force, the fares from London to Clacton-on-Sea being then 20s. and 12s., first and third class respectively. Tourist tickets include both break-of-journey and alternative station facilities on a comprehensive basis. In the event of *paterfamilias*, and possibly one or more sons or daughters, being able only to come down for week-ends, the fares are 13s. 6d. or 7s. 6d., also available by any train, and the advantages of the 5.6 p.m. tea car train on Friday and the 7.2 a.m. up breakfast car train on Monday or Tuesday enable the limited time available to be utilised to the best advantage and without rush or discomfort. It may also be mentioned that, as a peculiarly Great Eastern institution, children travelling with half-fare tickets are served with breakfast, luncheon or dinner at half the usual rates.

These tickets meet the standard requirements, but to enable people who require to come up to town specially, or several times during a family holiday, extra journey tickets become useful in the one case, while a short-period season ticket meets the other.

Extra journey return tickets are issued at seaside stations to the station at which the tourist or fortnightly tickets were issued and back, to a member of a family staying at the seaside, upon production of not less than two tourist or fortnightly tickets. These cheap return tickets are issued to enable a member of a family to make occasional journeys to the resident station and back, for business or other purposes, during the stay of the family at the seaside, and are available for eight days, including the days of issue and return. In the event of two members of the family requiring to make the extra journey, the production of not less than four tourist or fortnightly tickets is necessary. These tickets are not issued to residents or to other than *bona-fide* visitors who have taken up their residence for not less than one week at the seaside. Extra journey tickets are not issued to Selby, York, stations on the Great Northern and Great Eastern Joint line or from Southend-on-Sea or Burnham-on-Crouch to stations Romford to Stratford inclusive, Epping, Ongar, Liverpool Street, Fenchurch Street, or the London suburban stations.

Therefore, in the case of Clacton-on-Sea, the head of the family, or possibly one of the grown-up sons or daughters, can obtain an extra journey at a cost of 12s. first class or 7s. 2d. third class, this representing a very considerable saving upon ordinary fares, and avoiding any necessity for restricting holidays to week-end visits where interruption would otherwise be a necessary complement to a vacation.

Then, to meet the requirements of the busy man who must be in town several days in the week, and who otherwise would be debarred from spending a continued holiday with his family, the seaside periodical ticket comes into use. For one week, still adopting Clacton-on-Sea as an example, the holder can travel as often as he likes, and by any train, between Clacton-on-Sea and Liverpool Street, at a cost of 28s. first class and 17s. 6d. third class. For a fortnight the rates are £2 2s. and £1 6s. 3d., even a



Photo] [*H. T. Worlock.*

GREAT EASTERN RAILWAY.

Southend express approaching Shenfield, 4-4-0 locomotive No. 1848.

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greater proportionate reduction on the ordinary fares; and for a month the cost is, in each case, £3 4s. and £2 2s. These tickets are not available at intermediate stations, as that is outside their purview, and if that is required the ordinary season tickets, also issued at very reasonable rates, would then come into operation. In other instances, however, rates are also provided which will allow of this facility.

It will therefore be seen that every reasonable requirement is thus met. Fortnightly or tourist tickets provide for the forward and return journeys of the family; a week-end (Friday or Saturday to Monday or Tuesday) ticket enables other members of the family or friends to run down over the Sunday; extra-journey tickets allow a special journey home or to town to be made; and a seaside periodical ticket enables business journeys to the city to be made as often as required within the period covered.

Arrangements of this class are in force at every holiday centre where justified, and before leaving this phase of our subject the Cromer rates may be set forth as a good example of a favourable long-journey resort:

	First Class.	Third Class.
Tourist Return	34s.	20s.
Fortnightly	27s. 6d.	15s.
Friday to Tuesday	22s.	11s.
Extra Journey	20s. 4d.	12s.
Periodical (month) ..	*£4 10 0	*£3 10 0
,, ,, ..	†£6 0 0	†£4 7 6

* Not available at intermediate stations.
† Available at intermediate stations.

All these facilities are given by ordinary trains, including the Norfolk Coast Express and other restaurant car trains. Tickets are also available from St. Pancras and *viâ* Cambridge, as well as *viâ* Colchester, while the break-of-journey (where allowed) and alternative station arrangements are useful. In this instance weekly and fortnightly season tickets are not issued, as there is hardly occasion therefor in view of the distances involved.

Among other facilities offered by the Great Eastern Railway may be mentioned the local season tickets issued in the holiday areas to holders of ordinary return, tourist, fortnightly and long-date excursion tickets. These are particularly useful for getting about and visiting neighbouring resorts and places of interest, as well as for seeing the Broads; and are issued for 7 or 14 days, as follows:—

		One Week.	Two Weeks.
Norwich, Yarmouth, and Lowestoft	1st class	13/6	20/-
,, ,, ,,	3rd class	9/-	13/6
Norwich, Yarmouth, Lowestoft, Cromer, Sheringham, Mundesley, Trimingham, and Overstrand	1st class	15/-	22/-
,, ,, ,,	3rd class	10/-	15/-
Norwich, Aylsham, Cromer, and Sheringham ..	1st class	10/6	16/-
,, ,, ,,	3rd class	7/-	10/6
Norwich, Cromer, Sheringham, Mundesley, Trimingham, and Overstrand	1st class	10/6	16/-
,, ,, ,,	3rd class	7/-	10/6
Norwich, Yarmouth, Lowestoft, Cromer, Sheringham, Mundesley, Trimingham, Overstrand, Fakenham, and King's Lynn	1st class	21/9	30/-
,, ,, ,,	3rd class	14/-	21/-
Cromer, Sheringham, Mundesley, Trimingham, Overstrand, and Wroxham	1st class	9/-	13/-
,, ,, ,,	3rd class	6/-	9/-
Cromer, Sheringham, and Aylsham	1st class	9/-	13/-
,, ,, ,,	3rd class	6/-	9/-

These tickets are available at all intermediate stations within the respective limits. Bicycles can also be included at slightly higher rates.

Mention may also be made of the weekly 8-day excursion tickets from London stations on Wednesdays; 11-day tickets from York, Selby, Doncaster, Lincoln, Spalding and other towns to seaside resorts; combined journey and hotel rates for week-ends at the Sandringham Hotel, Hunstanton (not issued at Whitsuntide nor during July, August and September), and the Great Eastern Hotel at Harwich and, for visitors to London, at the Liverpool Street Hotel; and the comprehensive tourist and long-date excursion arrangements from London and various Great Eastern stations virtually to anywhere in England, Wales and Scotland, frequently including extensive break-of-journey facilities. There are also the "Cathedral" and other special route tickets, while circular tours can usually be arranged to suit requirements, whether advertised or not.

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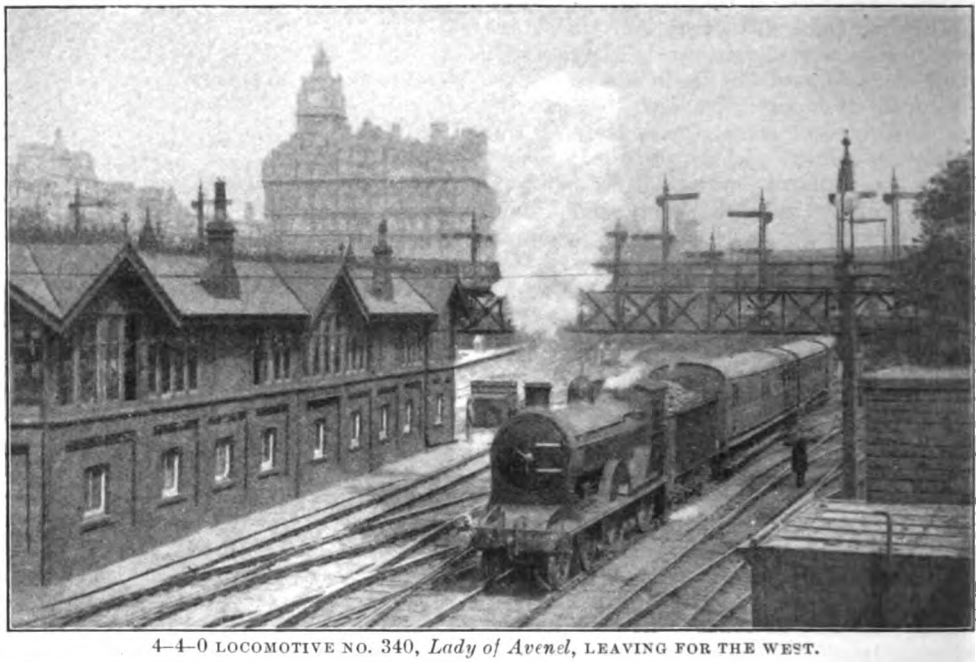
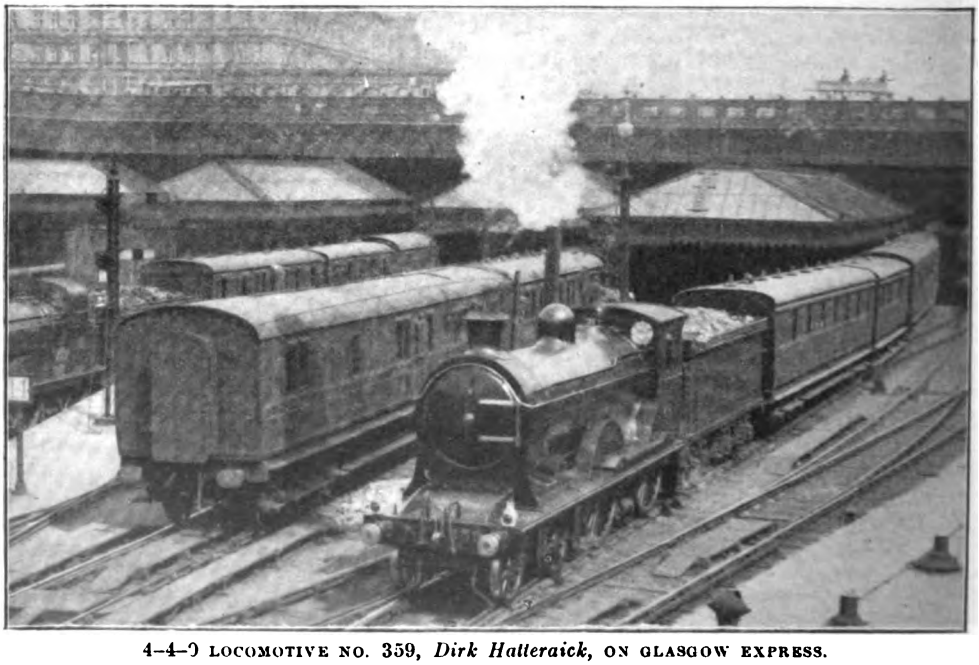
SCENES AT WAVERLEY STATION, EDINBURGH: NORTH BRITISH RAILWAY.

Photographed by J. B. SHERLOCK.



4–4–0 LOCOMOTIVE NO. 340, *Lady of Avenel*, LEAVING FOR THE WEST.



4–4–0 LOCOMOTIVE NO. 359, *Dirk Hatteraick*, ON GLASGOW EXPRESS.

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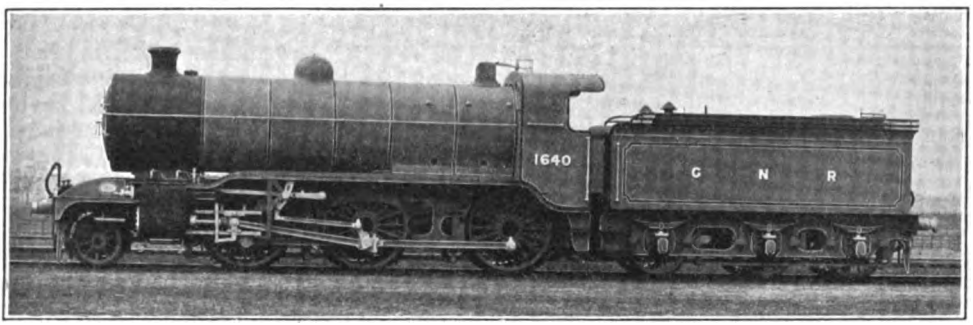

NEW 2–6–0 LOCOMOTIVE: GREAT NORTHERN RAILWAY.
Designed by Mr. H. N. Gresley, Locomotive Engineer.

These engines, generally similarly to the 1630 class, have larger boilers and increased dimensions in other ways. The boiler is now 5 ft. 6 in. diameter inside, and the barrel is 11 ft. 5¼ in. long; heating surface being:—tubes, 1,523 sq. ft.; firebox, 144 sq. ft.; superheater, 403 sq. ft.; total 2,070 sq. ft. Grate area is 24 sq. ft.; cylinders, 20 in. by 26 in.; coupled wheels, 5 ft. 8 in.; leading wheels, 3 ft. 2 in.; steam pressure, 170 lbs. per sq. in.; weight in working order, 63 tons 14 cwt.

British Locomotive Practice and Performance.

By CECIL J. ALLEN.

THE first matter requiring attention in the present article is the relation of the total heating surface of a locomotive boiler to the aggregate cylinder volume, which formed the subject of the last column in the table of dimensions and proportions of modern superheater express locomotives in the May number of the RAILWAY MAGAZINE. The introduction of superheating has brought about a significant reduction in this ratio, on account of the substantial increase in the diameter of cylinders, as will clearly be seen by comparing these figures with those which appeared in March, 1911. As is well known, the use of superheated, in place of saturated steam, allows of a greater range of expansion in the cylinders without any proportional increase of condensation—in fact, the condensation is considerably reduced—as the reduction of temperature that accompanies expansion is not sufficient to lower the temperature of the superheated steam below the saturation point. Consequently increase of cylinder dimensions, as associated with superheating equipment, has been very marked, and this increase has also in most cases been accompanied by a reduction in the working boiler pressure, in order to divide the advantages gained by superheating between increased tractive power, and reduced boiler maintenance. The last-mentioned consideration, however, does not enter into the question of the moment, which is merely that of the adequacy of the boiler heating surface to supply steam to the cylinders, as expressed in the ratio of the area of the former to the volume of the latter.

The Great Bear, with a ratio of 319 sq. ft. per cub. ft., easily outdistances all competitors, the employment in this case of a boiler of vast dimensions being coupled with that of cylinders of comparatively moderate size—identical, indeed, with those of the latest Great Western Railway 4–6–0 engines, and smaller than those of the London and North Western "Claughton" class, or the Lancashire and Yorkshire 4-cylinder 4–6–0 type. Among 4–6–0 express engines the variation, on the whole, is not considerable, the maximum ratio being that of the Great Central Railway's *Sir Sam Fay*, with 257 sq. ft. of heating surface to every cub. ft. of cylinder volume, and the minimum the Glasgow and South Western Railway's engine No. 129, with a figure of only 177 sq. ft. per cub. ft. The first-mentioned type, together with the Caledonian "Cardean" class, in which the ratio is 228, are engines with boilers of very great length, and a correspondingly extensive

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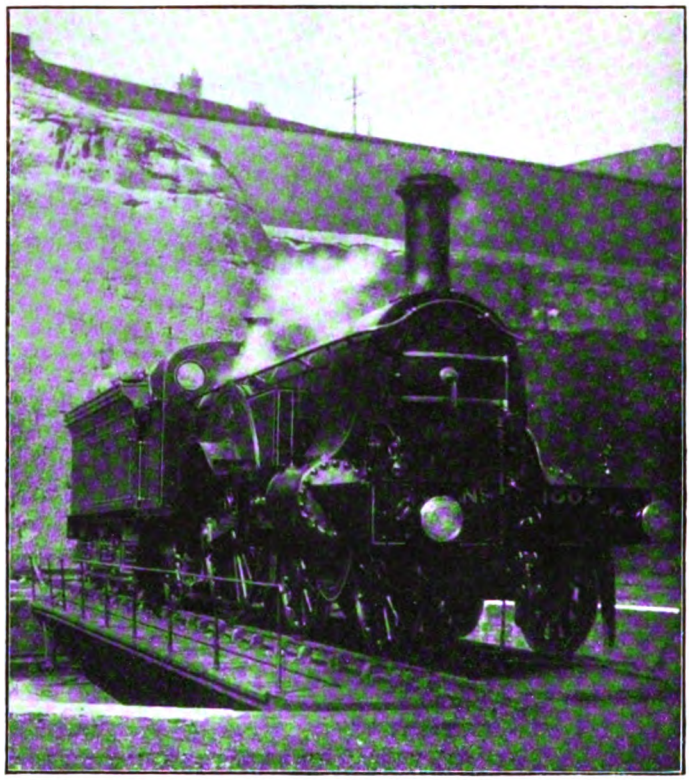

Photo] [*F. H. Gillford.*

GREAT NORTHERN RAILWAY.

No. 1006, one of the four remaining 8 ft. singles, on the turntable at Nottingham (Victoria) before taking the 3.25 p.m. Grantham express.

heating surface. In the Great Western 2-cylinder 4–6–0 type, however, the high ratio of 219 is more attributable to the comparative smallness of the cylinders than to the extent of the heating surface. At the other end of the scale we find the London and South Western 6 ft. 7 in. 4–6–0 engines, with a proportion 185 sq. ft. per cub. ft., the London and North Western "Claughtons," with 184 and the superheater "Experiments" with 191, and the Great Eastern 1500 class, with a ratio of 188. The same characteristics are apparent in the case of the 4–6–0 mixed traffic engines, where the table is headed by the Caledonian and Great Central engines, with proportions of 257 and 219 sq. ft. per cub. ft. respectively. Shorter boilers in the case of the 2–6–0 mixed traffic engines are responsible for reducing the average ratio in this case to 161 sq. ft. per cub. ft. It is interesting to note that the ratio of total heating surface to aggregate cylinder volume averages 203 sq. ft. per cub. ft. in the case of the six-coupled superheater express engines and 190 sq. ft. per cub. ft. in that of the mixed traffic engines, as against the average of 218 for six-coupled non-superheater engines in the table of March, 1911.

In the "Atlantic" type the ratio of heating surface to cylinder volume is always high. Cylinder dimensions must be kept at a moderate figure, as the adhesion weight with this wheel arrangement is limited; on the other hand the boiler is usually large, as in the case of all ten-wheeled types, one of the chief advantages urged in favour of the "Atlantic" being the reserve supply of steam available at all times. The extreme exponent of this policy was Mr. H. A. Ivatt, the proportion in the case of his non-superheater "Atlantics" being as high as 326 sq. ft. per cub. ft., and beating even that of *The Great Bear*. In the former case the provision of a 5 ft. 6 in. boiler is coupled with that of unusually small cylinders, 18¾ in. diameter by 24 in. stroke. With the introduction of superheating, however, the cylinder diameter has been increased to 20 in., but, as will be seen in the table, the Great Northern superheater "Atlantics" still head the whole table—*The Great Bear* alone excepted—with the very high figure of 274. On the London, Brighton and South Coast Railway, with an engine almost identical in general design, larger cylinders, 21 in. diameter by 26 in. stroke, are employed, with the result that, although the heating surface also is increased, the ratio of the latter to the cylinder volume is dropped to 242 sq. ft. per cub. ft. This figure corresponds closely with the 241 sq. ft. per cub. ft. of the North Eastern three-cylinder "Atlantics" of class Z1, the average figure for "Atlantics" being thus 252, as against 258 in the pre-superheater days of 1911.

There is more proportionate variety among the 4–4–0 engines than among those

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of any other wheel arrangement, but it will be noticed, generally speaking, that the figures are much lower than those of the ten-wheeled types just dealt with. The list is headed by the new Glasgow and South Western 4–4–0 type, with a proportion of 209 sq. ft. of heating surface to every cub. ft. of cylinder volume. This result is attained by the use of a boiler of exceptional dimensions; but I must confess that I was not impressed with the steaming powers of these engines in a couple of runs that I had recently behind one of them, the description of which considerations of space will compel me to hold over until the next issue. On the other hand, the new "Director" class of the Great Central Railway, with the almost identical ratio of 208, seems rapidly on the way to establishing itself as the finest type, from the performance standpoint, that Mr. J. G. Robinson has ever designed for that railway. The only other superheater 4–4–0 type in which the proportion exceeds 200 is the Great Western "Flower" class, with 204 sq. ft. of heating surface to every cub. ft. of cylinder volume; in this case, however, as with the "Court" 4–6–0 class, the reason may be traced to the smallness of the cylinders rather than the size of the boiler. At the other extreme, however, we have some striking figures. The 4–4–0 re-built superheater engines of the Lancashire and Yorkshire Railway, whose phenomenal performances were engaging our attention in last month's issue, boast only 116 sq. ft. of heating surface to every cub. ft. of cylinder volume. In the North Staffordshire superheater 4–4–0 No. 38 the ratio is 135, in the Midland re-built superheater type 150, and in the Great Northern 4–4–0 class D1, *mirabile dictu*, as low as 152 sq. ft. per cub. ft., thus showing that Mr. Ivatt, in his later designs, was inclined to favour a more customary ratio than that which has rendered his non-superheater "Atlantics" unique. The average proportion in the case of the 4–4–0 engines works out at 174, as against 189 in the case of the non-superheater engines shown in the 1911 table.

In the tank engines the ratio is usually low, the constant starting and rapid acceleration from rest required with engines of this type necessitating the provision of cylinders as large as the boiler is capable of supplying with steam. Curiously enough, in direct contrast to the four-coupled and six-coupled express types, the proportion is much less in the case of the four-coupled tank engines than in that of the six-coupled tanks, averaging as it does 159 sq. ft. per cub. ft. in the latter case as against 126 in the former. Among the four-coupled tanks are some really extraordinary examples, as the Lancashire and Yorkshire 2–4–2 superheater engines with a total of only 920 sq. ft. of heating surface coupled with cylinders as large as 20 in. diameter by 26 in. stroke, giving a ratio of only 97 sq. ft. per cub. ft. In the case of the Brighton superheater 4–4–2 tanks of class I3, also, the ratio is only 123, the cylinders being 21 in. by 26 in., with a total heating surface of 1,281 sq. ft. And yet these engines are as noted for their performance as those in which the ratio is the highest; indeed, so far as brilliant work on the road is concerned, I am inclined to think that the engines with the lowest proportion of heating surface to cylinder volume, strangely enough, give the most consistently fine results. It would be a matter of the greatest interest to discover in what degree these wide variations in locomotive proportions, even though they may not greatly affect performance, influence the costs of running and maintenance.

I have been intending for some time to

Photo] [*F. H. Gillford.*

GREAT CENTRAL RAILWAY.

No. 424, *City of Lincoln*, waiting at Nottingham (Victoria) to take the 5.54 p.m. Grimsby express.

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tabulate a series of runs made behind the large 4–6–0 engines of the Caledonian Railway as affording a direct comparison between the performances of a type built in the first instance without superheating apparatus, and provided at a later date with this equipment. So far as performance goes, it is not possible to say that the provision of a superheater has effected any improvement in the running; taking a general average of the runs, no difference whatever is apparent, unless it be in the slightest degree in favour of the engines as originally built. As has been mentioned previously in these pages, however, the engine to which a superheater is fitted without any modification of existing dimensions—more especially cylinder diameter—is at a disadvantage as compared with the engine that has been designed with superheating in view. Moreover, there are other explanations of this apparent anomaly. Most speed enthusiasts will have noticed, to their regret, that the recent policy of the Caledonian Railway has been one of deceleration, although with the altogether laudable intention on the part of the Company of maintaining its reputation as the "True Line" in the matter of time-keeping. The working times have also been re-arranged in a much more rational fashion, so that much of the record-breaking for which the Caledonian Railway was once famed is now a thing of the past. I think perhaps the infection of these changes must have spread, judging by recent runs, to the drivers, although I should be the last to deny that fine work is still performed on the Caledonian Railway; but doubtless the mitigated necessity of thrashing the engines and the provision in many cases of superheating apparatus, have together done much to reduce the fuel and water consumption and to curtail the expenses of maintenance.

It will be noticed from the table given below that most of my runs were made with

CALEDONIAN RAILWAY—CARLISLE-GLASGOW.

Distance (miles)	Run No.	1	2	3	4	5	6	7	Schedule Times (min.)	8	9	10	Schedule Times (min.)
	Engine: 4-6-0, No.	903, *Cardean*.								50	907		
		Without Superheater.		Superheater.						N.S.	N.S.	S.	
	Load (axles)	42	46	44	46	50	50	54		30	42	38	
	Load (tons)	305	335	320	335	360	360	390		210	295	295	
—	Carlisle .. dep.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00 d	0
4¼	Rockcliffe .. pass	6.40	6.35	6.35	6.40	6.40	6.30	6.45	—	6.30	6.55	9.10	—
8¾	Gretna .. ,,	11.00	10.55	11.20	11.10	11.25	11.00	11.20	10	10.50	11.25	14.00	11
16¼	Kirtlebridge ,,	20.45	21.05	21.40	21.10 b	22.40	21.10	21.30	20	20.35	21.00	24.00	21
25¼	Lockerbie .. ,,	30.05	31.05	31.45	34.20	33.05	31.05	32.00	30	30.15	30.35	34.15	31
34½	Wamphray ,,	38.20	39.05	40.15	43.20	41.15	39.25	40.40	—	38.05	38.10 c	42.20	—
39¾	Beattock arr.	44.30	45.15	46.20	49.40	47.20	45.35	47.10	44	pass	49.05	48.40	46
	dep.	45.3	46.20	47.45	52.10	48.30	47.00	48.30	46	43.45	50.40	50.00	48
45¼	Greskine .. pass	56.15	57.50	58.55	63.35	59.10	57.40	60.10	—	54.25	61.15	60.45	—
49¾	Summit .. ,,	64.15	66.35	67.00	71.55	67.15	65.40	69.05	66	63.55	69.10	68.40	68
55¼	Crawford .. ,,	69.55	72.05 a	72.35	77.30	72.50	71.15	74.45	—	69.55	74.35	74.40	—
63¼	Lamington ,,	76.55	79.30	79.35	84.50	79.30	78.20	81.40	—	76.50	81.00	82.20	—
66⅞	Symington ,,	80.45	83.40	83.20	88.20	82.50	82.05	85.20	—	81.00	85.00	86.45	85
73¾	Strawfrank arr.	87.20	90.10	89.55	94.45	89.10	88.35	91.50	89	—	—	—	—
29⅞	Strawfrank-Glasgow	38.40	38.00	36.45	38.05	37.40	36.50	38.05	37	—	—	—	—
35½	Symington-Glasgow	—	—	—	—	—	—	—	—	47.20	46.15	49.30	51
103	Net running times	122¾	124	125¼	125	124½	123½	128	124	—	—	—	
102⅞	Carlisle-Glasgow	—	—	—	—	—	—	—	—	125½	124¼	132	134

N.S.—Non-superheater. S.—Superheater. a—p.w. check, Abington.
b—Signals, Lockerbie South, dead stand. c—Signals, Mackealty box, dead stand.
d—Signals, Kingmoor, severe slack.

Note:—Altered schedule of 8.13 p.m. ex-Carlisle (runs 1-7) is as follows:—Gretna, 11; Kirtlebridge, 21; Lockerbie, 31; Beattock, arr. 45, dep. 47 mins.; thence as shown above to Strawfrank; Strawfrank-Glasgow, 36 mins.

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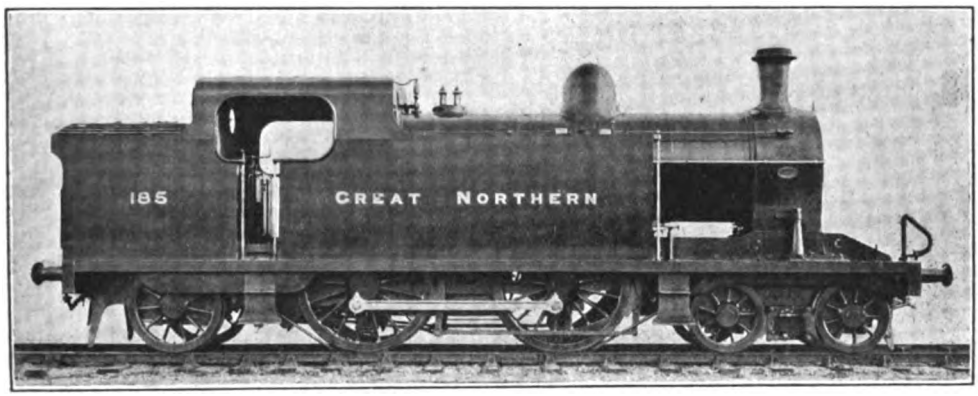
the famous No. 903, *Cardean*. Although this engine is generally considered the representative engine of the class, it was not the pioneer of the type. It was in 1903 that Mr. McIntosh first introduced the 4-6-0 engine for fast main line service in the shape of Nos. 49 and 50, built expressly for working the 2 p.m. express from Glasgow to London as far as Carlisle, and the corresponding north-bound train from Carlisle at 8.13 p.m. back to Glasgow. The charge of driver Gibson. I think it will be agreed that, where such a proceeding is possible, the practice of keeping one engine and crew on an important "turn" of this character is a wise policy, as it ensures a certain regularity of working and time-keeping, which is amply demonstrated in the subjoined table. In this particular case the policy in question seems to me the more commendable, in that I consider this —taking an all-the-year-round average—to



NEW 4-4-2 SIDE TANK ENGINE: GREAT NORTHERN RAILWAY OF IRELAND.
Designed by Mr. G. T. Glover, Locomotive Superintendent.

Five of these engines have been supplied by Messrs. Beyer, Peacock and Co., Ltd., to the Great Northern Railway of Ireland. They are not fitted with superheaters, owing to the work for which they are designed involving so much shunting and so many short runs. All new locomotives for main line work on this railway are, however, to be of the superheater type.

In order to obtain the required proportion of braked weight, the bogie wheels have been fitted with a brake mechanism worked from a separate cylinder carried on trunnions between the bogie frames. The trailing truck is of the Bissel type, having radial horn-guides as an additional safeguard. Combination injectors, a triple sight-feed Dewrance lubricator, and double pop safety valves are fitted on these engines. Wherever possible, details have been kept standard with parts already existing on this railway. These engines are built up to the maximum weight allowed on any one pair of wheels, *i.e.*, 17 tons per pair.

The following are the principal dimensions:—
- Gauge, 5 ft. 3 in.
- Cylinders, 18 in. by 24 in.
- Heating surface—
  - Tubes, 986·12 sq. ft.
  - Firebox, 106·0 sq. ft.
  - Total, 1,092.12 sq. ft.
- Grate area, 18·3 sq. ft.
- Working pressure, 175 lb. per sq. in.
- Diameter of wheels—
  - Coupled, 5 ft. 9 in.
  - Bogie, 5 ft. 2 in.
  - Radial, 4 ft. 0 in.
- Total Wheelbase, 28 ft. 4½ in.
- Weight in working order, 65 tons 2 cwt.
- Bunker capacity, 3½ tons.
- Tank capacity, 1,700 gallons.

series 903-908, identical in all dimensions with the pioneer engines, save in the higher pitch of the boiler, which gives the erroneous impression of larger proportions, appeared in 1906, and very shortly afterwards No. 903 was put on to the 2 p.m. service, replacing Nos. 49 and 50. Save for brief intervals when under repairs, *Cardean* has continued on the service uninterruptedly until the present time, mainly under the

be quite the most difficult express locomotive "turn" on the Caledonian system. On the 2 p.m. *ex*-Glasgow No. 903 takes daily a *minimum* load of 46 axles, or 310 tons empty, which in summer may be increased to 400 tons, or over, and this load is almost invariably taken unpiloted over Beattock Summit, without loss of time. It is not difficult, however, to reach Carlisle in 2¼ hours from Glasgow, this timing for the

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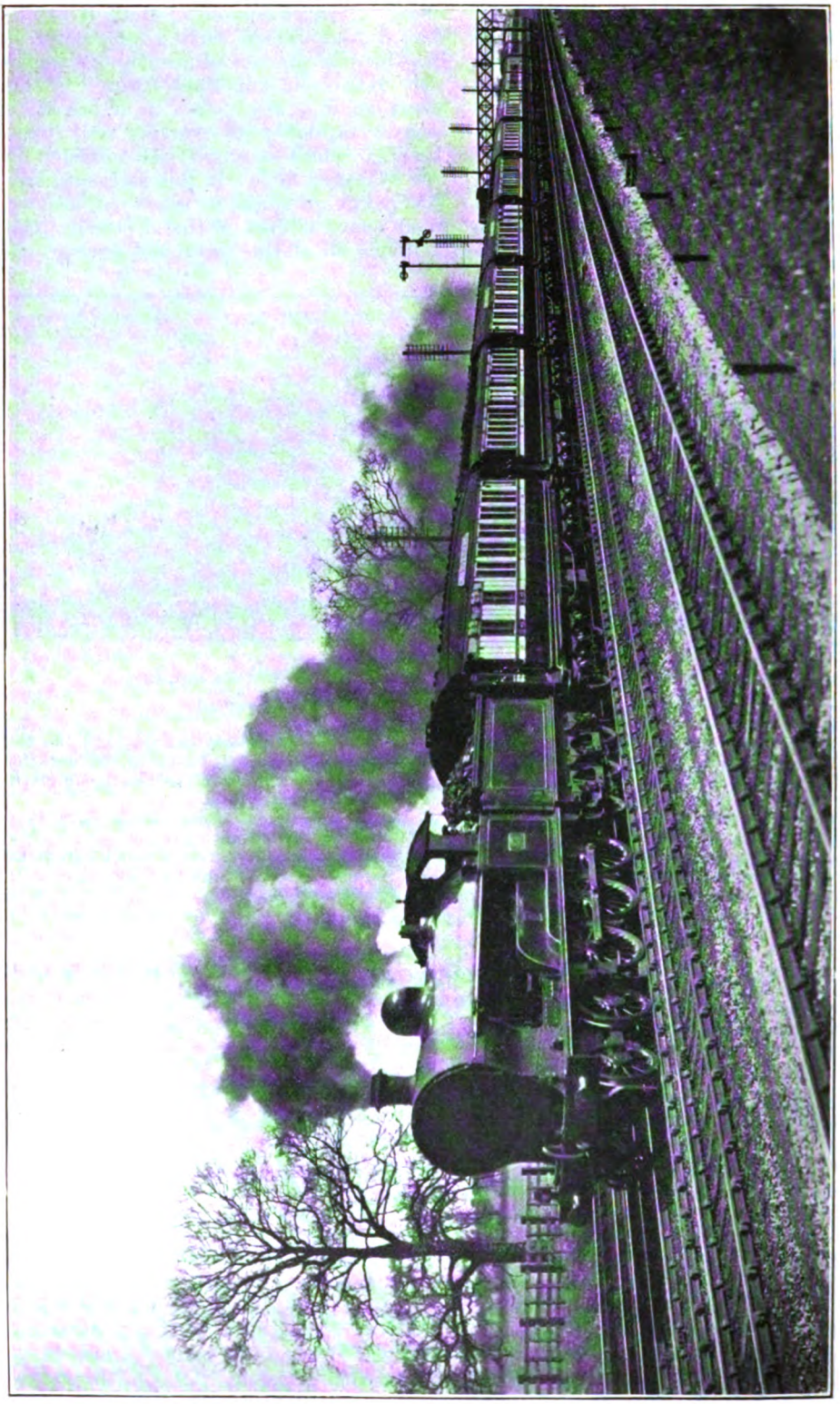

[*F. E. Mackay.*

Photo]

LONDON AND NORTH WESTERN RAILWAY.

2 p.m. down West-Coast Corridor Dining Car express. New 4-6-0 locomotive (Schmidt Superheater) No. 979, *W. M. Thackeray.*

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102⅜ miles journey allowing, as it does, 85 min. for the stiff climb of 52⅝ miles from Glasgow to the summit.

The work required in the reverse direction, however, always seems to me considerably harder. A total time is allowed of 2 hours 7 min.—8 min. less than the time booked to the South-bound train—and this includes two stops, one at Beattock to attach a bank engine in rear, and one at Strawfrank Junction, outside Carstairs, to detach the Edinburgh vehicles. Taking a general average, the load is just as heavy as that of the 2 p.m. *ex*-Glasgow; it is but rarely now that the original load of seven twelve-wheelers is seen without at least one or two additional eight-wheelers attached for Glasgow, bringing the empty weight of the train up to 310 or 335 tons respectively. As to *maximum* load, the spectacle that I witnessed on the evening of Easter Monday last may be taken as a fair example: the train arrived at Carlisle with 58 axles in charge of a "Prince of Wales" and a "Claughton," but here, although an extra eight-wheeler was added, bringing the full weight of the crowded train up to at least 455 tons, *Cardean* started away for Beattock unassisted, and with truly extraordinary rapidity, the speed as the last coach passed me at the end of the platform being at least 20 miles per hour. I would have given something for the opportunity of timing this run, but business in the less inspiring regions of West Cumberland unfortunately demanded attention. The initial booking of 44 min. to Beattock is practically a "counsel of perfection" with a train of this weight, as the major part of this 39¾ miles distance is on adverse grades; indeed, I have never yet seen this timing exactly kept on any train without a pilot. Curiously enough, the next booking—from Beattock to Strawfrank—is the easiest of the three, 20 min. being usually more than sufficient to compass the 10 miles' ascent to Summit box, where the bank engine is "slipped," and the 23 min. allowance for the 23⅜ miles thence to Strawfrank being subject to curtailment *ad libitum* according to the speed on the falling grades. Time, therefore, is usually kept to this point, but the margin is very fine. The final booking of 37 min. from Strawfrank to Glasgow is again exceedingly "tight," even with the load reduced by 130 tons—the average weight of the Edinburgh portion. As we shall see in a moment, the grades are mainly falling, and sharply so, but the slacks are so numerous as to preclude any attempt at fast running, so that any improvement on this time is practically an impossibility.

As regards the gradients, a little more may be said in detail. The start from Carlisle is auspicious, commencing as it does with ½-mile down at 1 in 110; after that come 6¼ miles of faintly undulating grades, with a favourable tendency—though barely proportionate to the rapidity of the acceleration—to the crossing of the Solway, near Gretna. At this point some really hard work begins, in the shape of a 15-mile climb at 1 in 200 to Brackenhill summit, broken only by a mile down at 1 in 200, and two at 1 in 1,600, or practically level, past Kirtlebridge. There is now a welcome respite in the shape of a drop of 6¾ miles to Nethercleugh, beyond Lockerbie, commencing with 1⅞ miles at 1 in 200, and proceeding with 4⅞ miles at 1 in 528. Following this there intervenes an undulating stretch of 6½ miles, mainly against the engine, and the ascent of Beattock bank is then entered upon, 3 miles at 1 in 200 and ½-mile at 1 in 165 bringing us to Beattock station. This, then, is the initial stretch, scheduled to be covered in 44 min. at an average speed of 54·2 miles per hour, although exactly half the distance is on grades adverse to the engine, and over 15 miles are as steeply inclined as 1 in 200! Beattock bank proper, from the station to the summit, is 10 miles long, starting at 1 in 88, steepening to 1 in 80, and finally to 1 in 75 for 5½ miles. The north side descent, however, is much more moderate, commencing with 2¼ miles at 1 in 100 to the first crossing of the Clyde, and then continuing at still easier grades, first at 1 in 150 for 1¾ miles and then averaging about 1 in 300, to the second crossing at Lamington. Hence there is a 3-mile rise, with 2 miles at 1 in 200, to Symington; a mile down at 1 in 100, another mile up at 1 in 200, past Thankerton, and a final descent of 2 miles at 1 in 100 to the third Clyde bridge, just before Strawfrank, complete the second stage of the journey.

It will be noticed that I have only given the times over the last section in skeleton form: the chief interest of the run really ceases at Carstairs, the times thence into Glasgow simply depending on the downhill speeds at which the engine is allowed to run, and the amount of caution with which the slacks are observed. From Strawfrank to Glasgow we have first a rise of 5¼ miles

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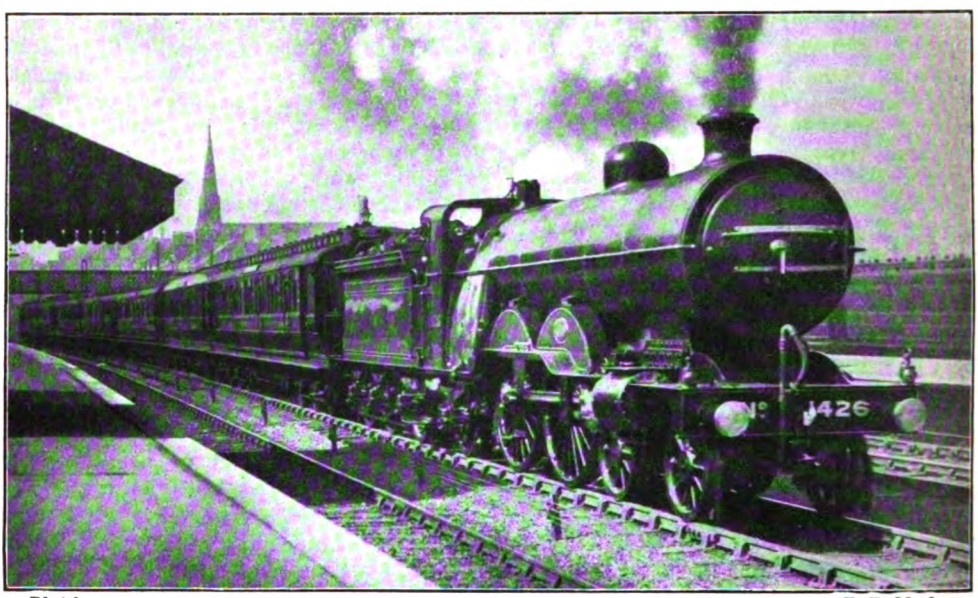
to Craigenhill summit, then steeply falling grades to Law Junction, where the 8.13 p.m. down express diverges to the North main line, speed being reduced for the junction, and also for the sharp curve beyond Wishaw. At Holytown the Edinburgh line is joined and slacks are enforced at the Mossend Junctions, and at Uddingston, where the old main line is rejoined, as also for a permanent way caution beyond Bellshill. The line falls steeply for almost the whole of the distance, but beyond Uddingston, just after the slack, is a short and steep upward pitch at 1 in 100 to Newton, before the final descent to Glasgow is entered upon. I do not know why the Holytown easier work—easier, that is, by comparison—is put in south of Crewe, while the heaviest pulling is reserved for the Preston-Glasgow section of the run.

After these somewhat extensive preliminaries, it is now high time to turn to a brief consideration of the runs shown in the table, of which Nos. 1–7 inclusive were made on the 8.13 p.m. *ex*-Carlisle, and Nos. 8–10 on the 3.57 p.m.—the Glasgow portion of the 10 a.m. *ex*-Euston, which calls at Symington, and has an easier timing. Run No. 1 was the fastest I have ever made behind *Cardean*, and in its earlier stages was really brilliant. A speed of 65·2 miles per hour had been attained on crossing the



Photo] [*F. E. Mackay.*

GREAT NORTHERN RAILWAY.

10.10 a.m. down Leeds and Bradford express passing Holloway.
4–4–2 locomotive No. 1426.

route is chosen for this particular train, as it increases the distance by $\frac{5}{8}$-mile, and provides five service slacks in place of the ordinary cautious speed from Wishaw through Motherwell: with all these hindrances, as will be appreciated, the time of 37 min. for the last 29$\frac{7}{8}$ miles is uncomfortably tight. Moreover, it is most difficult to understand why this train, in contradistinction to the usual Anglo-Scottish practice, has the most difficult schedules at the conclusion of its journey; it is more customary, as in the case of the 10 a.m. down, to finish with an "easy" timing, in order to allow of recovery of lost time, but in this case the Solway, while the first 7$\frac{1}{4}$ miles continuous ascent at 1 in 200—almost exactly equivalent to Potters Bar bank on the Great Northern Railway—were breasted at a minimum speed of 49·2 miles per hour. We went up the second 4$\frac{1}{4}$-mile stretch at a minimum of 50·7 miles per hour. Beyond Lockerbie we travelled freely at 69·2 miles per hour for some distance, and stopped at Beattock in only 30 sec. over the scheduled time—the nearest to that optimistic figure, indeed, that I ever expect to record. An excellent ascent of the bank followed, speed rising to 37·2 miles per hour on the lower portion, and not falling

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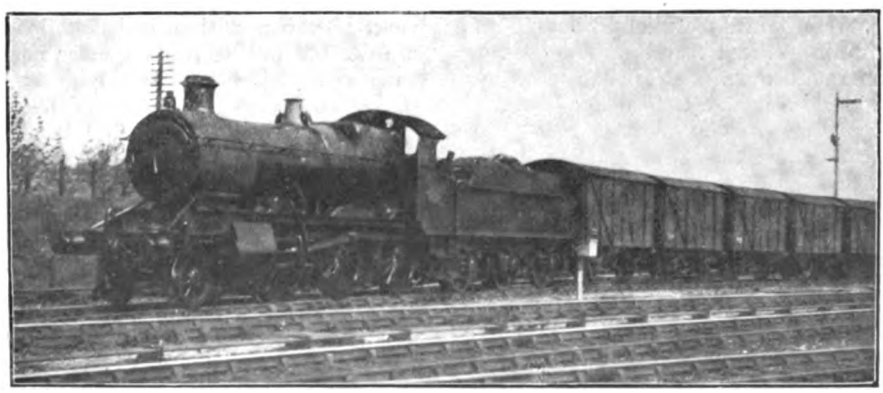
Photo] [*E. A. Gurney-Smith.*

MIDLAND RAILWAY.

Cheltenham Race Special passing Barnt Green.

below 30·4 at the summit, and we thus gained 1¼ min. on schedule; from the summit a leisurely descent, with a speed at no point exceeding 68·1 miles per hour, brought us into Strawfrank 1 min. 40 sec. inside booked time. From Strawfrank into Glasgow the time allowance was exceeded on account of extra signal slacks, but for all that the arrival was punctual, this being one of the only two occasions on which I have recorded the exact observance of the 127-min. time from Carlisle to Glasgow. Run No. 2, also made in *Cardean's* pre-superheat days, was similarly a good effort with a heavier train, though not up to standard of run No. 1. The speed at Solway bridge was again 65·2 miles per hour, but on the first 1 in 200 uphill stretch the rate fell to 45·9 miles per hour, and beyond Lockerbie it did not exceed 68·1. Both the climb to Summit box and the ensuing descent were slower than previously, and, with the hindrance of a relaying check before Lamington, we reached Strawfrank over a minute in arrears. The net running time to Glasgow, however, was exactly as booked—124 min.

We come now to the five runs behind *Cardean* as superheater-equipped—Nos. 3–7 inclusive. No. 3 was not a particularly brilliant effort, the speed not rising above the mile-a-minute rate at the Solway bridge, and falling as low as 43·7 miles per hour on the first 1 in 200 stretch, and 45·5 on the second. Beyond Lockerbie, also, no higher speed than 66·1 miles per hour was touched. The ascent of the bank was fair, speed rising to 34·4 miles per hour before Greskine, and not falling below 31·3 at the summit, where ¾ min. had been gained from Beattock, while the descent to Strawfrank was also fair, a further 50 sec. being gained with maxima of 69·2 at Crawford and 70·3 at Lamington. For all this, however, the running from Carlisle showed a loss of



Photo] [*K. H. Ricketts.*

GREAT WESTERN RAILWAY.

One of the latest mixed traffic 2–6–0 locomotives, No. 4355, working fast goods train.

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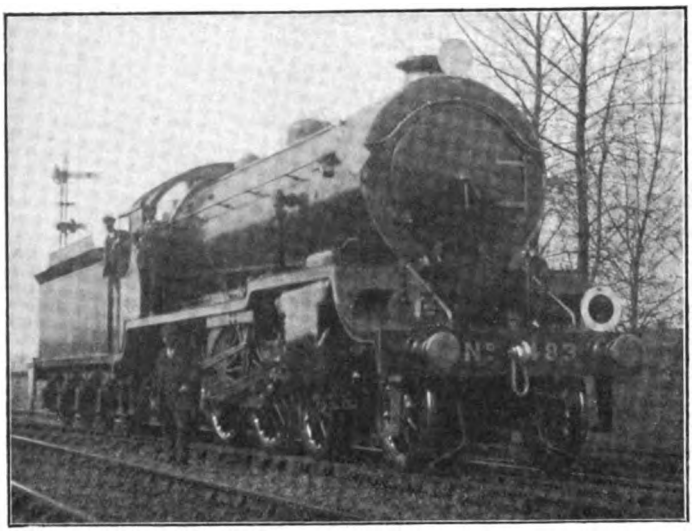

Photo] [*G. M. Wells.*

LONDON AND SOUTH WESTERN RAILWAY.
No. 483, new 4–6–0 locomotive of the Schmidt superheater series.

nearly a minute on schedule. From Strawfrank to Glasgow this was my fastest run, ¼-min. being gained, but such a feat is quite exceptional. On run No. 4 we started well, the running closely corresponding with that of the engine without superheater in column 2, hauling the same load. The rather remarkable speed of 68·1 miles per hour was attained beyond Floriston, but the rate fell to 43·7 on the subsequent 1 in 200 ascent. Approaching Lockerbie we had the misfortune to be stopped dead by signal at the South box, and this mishap seemed to have a disheartening effect on the driver, as the running thereafter was distinctly mediocre. After Beattock a speed of 34·3 miles per hour was attained on the bank, but beyond the summit no higher speed than 68·1 miles per hour was reached, so that only 25 sec. were gained between Beattock and Strawfrank. From Carstairs to Glasgow the running also was slower than usual, the total loss on schedule time being 7 min. 20 sec. from Carlisle, of which at least 1 min. would go against the engine. It is only fair to mention, however, that the wind on this occasion was strong from the east, and hampered the running almost throughout.

Runs 5, 6 and 7 were made with really substantial loads, and in the first-mentioned instance there was the additional disadvantage of a very high south-west wind, which caught us badly on the exposed parts of the line. Directly on this account the speed did not rise above 59·5 miles per hour at the Solway, and fell as low as 38·8 on the first climb past Kirkpatrick, where the wind could be distinctly felt rocking the coaches. On the second ascent, however, we were more sheltered, and no lower speed than 42·9 miles per hour was registered. Beyond Lockerbie we touched 68·1 miles per hour, but on reaching Beattock we had dropped 3 min. 20 sec. An exceedingly fine recovery was now made, however. After stopping for only 70 sec. to attach the bank engine—quite a "record" in itself!—the bank was breasted in the notable time of 18¾ min., an acceleration to no less than 36 miles per hour being registered on the 1 in 80, with a final minimum of 31·7 on the 1 in 75 at the summit. Moreover, this was not the end of the time recovery, as driver Gibson for once quite "let go" on the falling grades to Lamington, running for miles beyond Elvanfoot at 71·4 miles per hour, and attaining a top speed of 76·3 at the Clyde bridge. By means of this fine effort, we were only 10 sec. behind time at Strawfrank, 2 min. 20 sec. having been gained between Beattock and this point.

Run No. 6, with the same load, but no wind, was the best I have recorded to Beattock with *Cardean* since the superheater was fitted. Rockcliffe was passed in record time, but the speed at Gretna did not exceed 62·5 miles per hour; on Kirkpatrick bank, however, with this heavy load, the rate did not fall below 44·1 miles per hour, while on Ecclefechan bank the lowest speed was 46·9 miles per hour. Beyond Lockerbie, however, the speed was barely as high as usual, not exceeding 66·1 miles per hour, but even then the time of 45 min. 35 sec. to Beattock, over 39¾ miles of comparatively stiff grades, represented exceedingly fine work with 360 tons behind the tender. The climb to the summit was also a trifle faster even than that of No. 6 run, speed rising to 36·3 miles per hour from the start, and then falling to 32·2 on the 1 in 75, although a recovery to 33·1 was recorded before we breasted the summit. With time now well in hand, the downhill speed was moderate,

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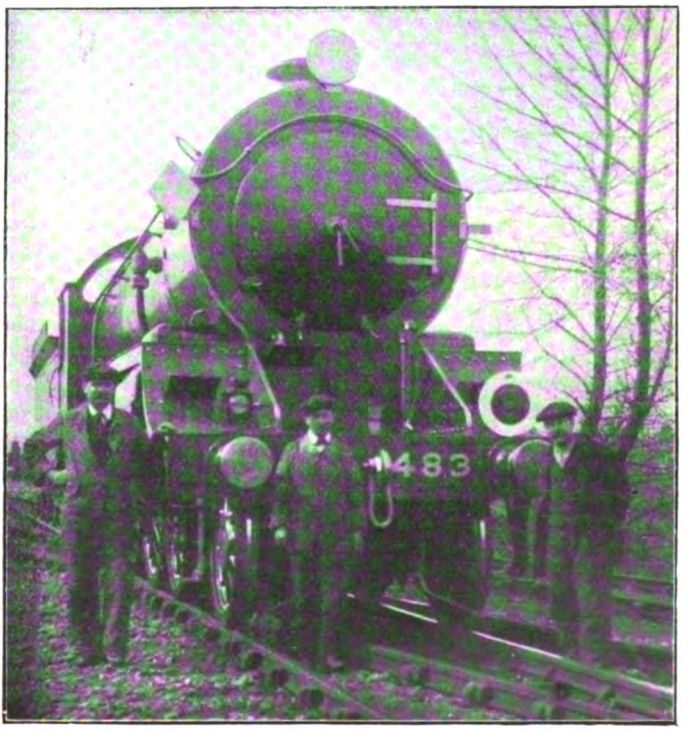
not exceeding a maximum of 70·3 miles per hour, and we reached Strawfrank with 25 sec. in hand. By means of a somewhat exciting finish, we completed the journey to Glasgow in 127 min. 10 sec., this run and No. 1 being the only cases in which exact end-to-end time was kept. On No. 7 run the load was very heavy, and seemed rather to over-tax the engine. We touched 61·6 miles per hour beyond Floriston, but fell to 42·9 on each of the 1 in 200 ascents, and did not exceed 64·3 at Nethercleugh, thus losing over 3 min. to Beattock. Speed was low on the incline, not rising above 32·6 miles per hour, and falling to 28·8 at the summit, while the downhill speeds were also very moderate, 71·4 miles per hour representing the highest figure touched. So time was barely kept even from Beattock to Strawfrank. This run was, I confess, a little disappointing, as I think the engine could do a little better even with so heavy a load, judging by the figures of runs 5 and 6, which were quite the finest of the series.

Since writing the foregoing paragraphs, I find by reference to the latest Caledonian working book that the times of the 8.13 p.m. down have been slightly modified, 45 min. being now allowed for the 39¾ miles to Beattock, and a reduced time of 19 min. thence to the Summit box. This rearrangement is quite in accordance with average running times. On the other hand, the Strawfrank stop is increased to 2 min., leaving only 36 min. for the final 29⅞ miles into Glasgow—a booking clearly impossible of achievement if the service slacks are duly observed.

Three further runs, on the 3·57 p.m. *ex*-Carlisle, are appended for the purpose of comparison. This used to be an even faster train in its early stages than the 8.13 p.m., but recently 8 min. has been added to the Carlisle-Symington time, and deducted from the somewhat ludicrous allowance of 59 min. previously in force over the 35½ miles from that point to Glasgow. Runs 8 and 9 were made on the original schedule with non-superheater engines, while 10 is on the present timing with a superheater-equipped locomotive. No. 8 was a record run to me in that this is the only occasion on which I have recorded an ascent of Beattock bank without either bank engine or pilot. The principal feature of the early part of the run was the speed from Lockerbie to Wamphray, this 8¾-miles stretch being covered in 7 min. 50 sec. with a maximum speed of 72·5 miles per hour. Beattock was passed in 15 sec. under 44 min.—equivalent to the "stop" time of the 8.13 p.m., but with a comparatively light load. The ascent of the bank took 10 sec. over 20 min., with a minimum speed of 26·6 miles per hour, and a smart descent to Symington resulted in an arrival 4 min. late on the old schedule, but which would be 4 min. early on the new! The highest speed touched was one of 73·8 miles per hour at Lamington.

Run No. 9 was finer, the load being much heavier, although even then well below the average of the evening train. The speed at the start was comparatively moderate, but after Gretna increasingly fine work was performed. Kirkpatrick bank was breasted at a minimum rate of 48·4 miles per hour.



Photo] [*G. M. Wells.*

ANOTHER VIEW OF NO. 483.

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and beyond Lockerbie we travelled very fast, covering the 8¾ miles to Wamphray in 7 min. 35 sec., with a maximum speed of 73·8 miles per hour, sustained for some distance. Luck was now dead against us, however, as we were stopped dead at Mackealty box for signals. Unluckily this also meant stopping at Beattock for a bank engine, whereas I had hoped that such fire-eating work as that just recorded might presage another unassisted ascent. However, the climb, achieved in 18½ min., was notably brisk, a speed of 36·9 miles per hour being attained on the lower part of the bank, and one of 33·6 maintained to the bank 46·9 miles per hour, while beyond Lockerbie a speed of 68·1 miles per hour was not exceeded. From Beattock the bank was tackled in good style, speed rising first to 37·2 miles per hour, and afterwards falling to 32·3 at the summit; we might even then have kept time to Symington but for the scrupulously moderate downhill running. In all these last three runs, especially No. 10, the very sluggish work scheduled beyond Carstairs adversely affects the total net running time from Carlisle; on No. 10 run we simply crawled from Law Junction into Glasgow, so as to avoid an early arrival.

Photo] [*H. T. Worlock.*

LONDON AND SOUTH WESTERN RAILWAY.

Down North Devon and Ilfracombe express passing Walton-on-Thames, 4–4–0 locomotive No. 463.

summit. Then followed the fastest downhill running I have yet timed on this section of the Caledonian Railway, with a speed of 71·4 miles per hour at Crawford, and a maximum as high as 77·5 at Lamington. Thus, as will be seen, our gross time to Symington was exactly in accordance with the present schedule, despite the signal stop, which cost, at the very lowest estimate, a full 5 min. The last run, No. 10, was commenced in a thick fog, and spoiled by signal checks at the start, although even then the work with this load left a little to be desired. The minimum rate on Kirkpatrick bank was 48·4 miles per hour, and on Ecclefechan

I make no apology for quoting from a contemporary concerning the pioneer engine of this type: "No. 49 is probably the most powerful engine now running in the British Isles, judging by mere dimensions, while a knowledge of how well Mr. McIntosh succeeds in realising in actual performance the potential efficiency of his engines, renders the qualification somewhat unnecessary."

Taking a general average of these ten runs, it would seem that the addition of the superheater has had no marked effect on the performance of these engines, which always has been, and still remains, of the finest quality.

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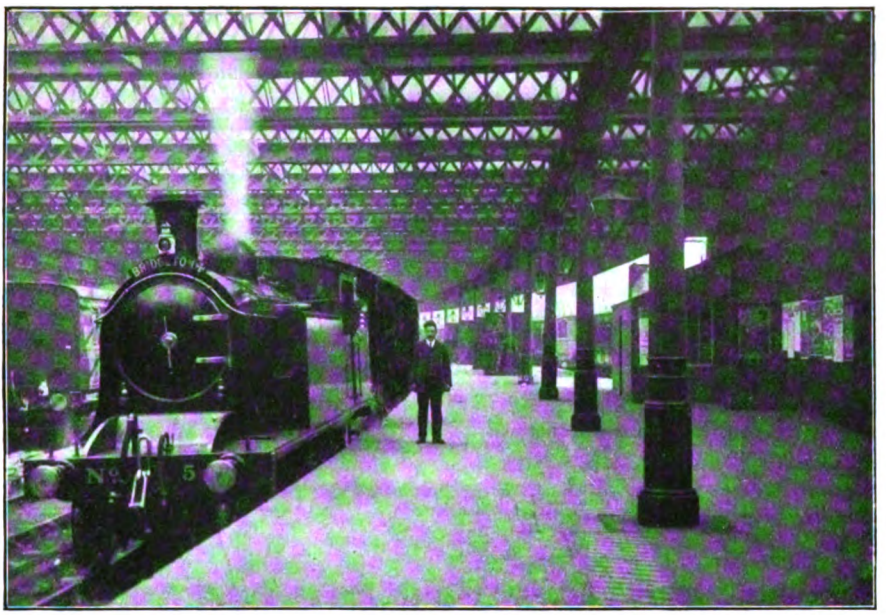

Photo] [*Wohlgemuth & Co.*

BRIDGETON CROSS STATION (INTERIOR).

The Glasgow City and District Railway

[No. I.].

By CHARLES C. LITTLEJOHN.

THE Glasgow City and District Railway, popularly known to Glasgow citizens as the "Underground," is a part of the complicated system of lines owned by the North British Railway Company on the northern side of the River Clyde. Queen Street (Low Level) is the principal station on the "City and District" line; but it will be more convenient to commence at the starting-point adopted by the Company in the working time-table for the Western Division of their system. This is High Street, the first station east of Queen Street. Until the end of last year this station was known as College, owing to its site being that originally occupied by the old University of Glasgow prior to the latter being transferred to Gilmorehill. On January 1st, 1914, however, the station was renamed High Street, after the thoroughfare in which it is situated. If the neighbourhood is not so classic as it once was, it still has an irresistible appeal to the sight-seeing visitor as being the heart of the "Auld Toon," with the grand old Cathedral within a few minutes' easy walk.

College Station was originally the terminus of the Coatbridge Railway, and no communication existed between it and the only other portion of the North British Railway in the city, the Edinburgh and Glasgow line to Queen Street. In 1886, however, on the opening of the Underground portion of the City and District, its character was at once changed from a terminus to a through station of comparatively minor importance, the bulk of the traffic passing to and from Queen Street (Low Level) thereafter. A new station was erected at High Street at the same time in lieu of the old terminus.

Adjacent is High Street Goods Depôt, one of the most extensive of its kind in Scotland. It occupies a large area to the north of the passenger lines at the east end of High Street passenger station, and is provided with all the latest facilities for handling the traffic carried by the large number of goods trains dealt with here daily. This is not the only goods station at College, it may be noted. To the south of the North British line is the Glasgow and South Western Railway's

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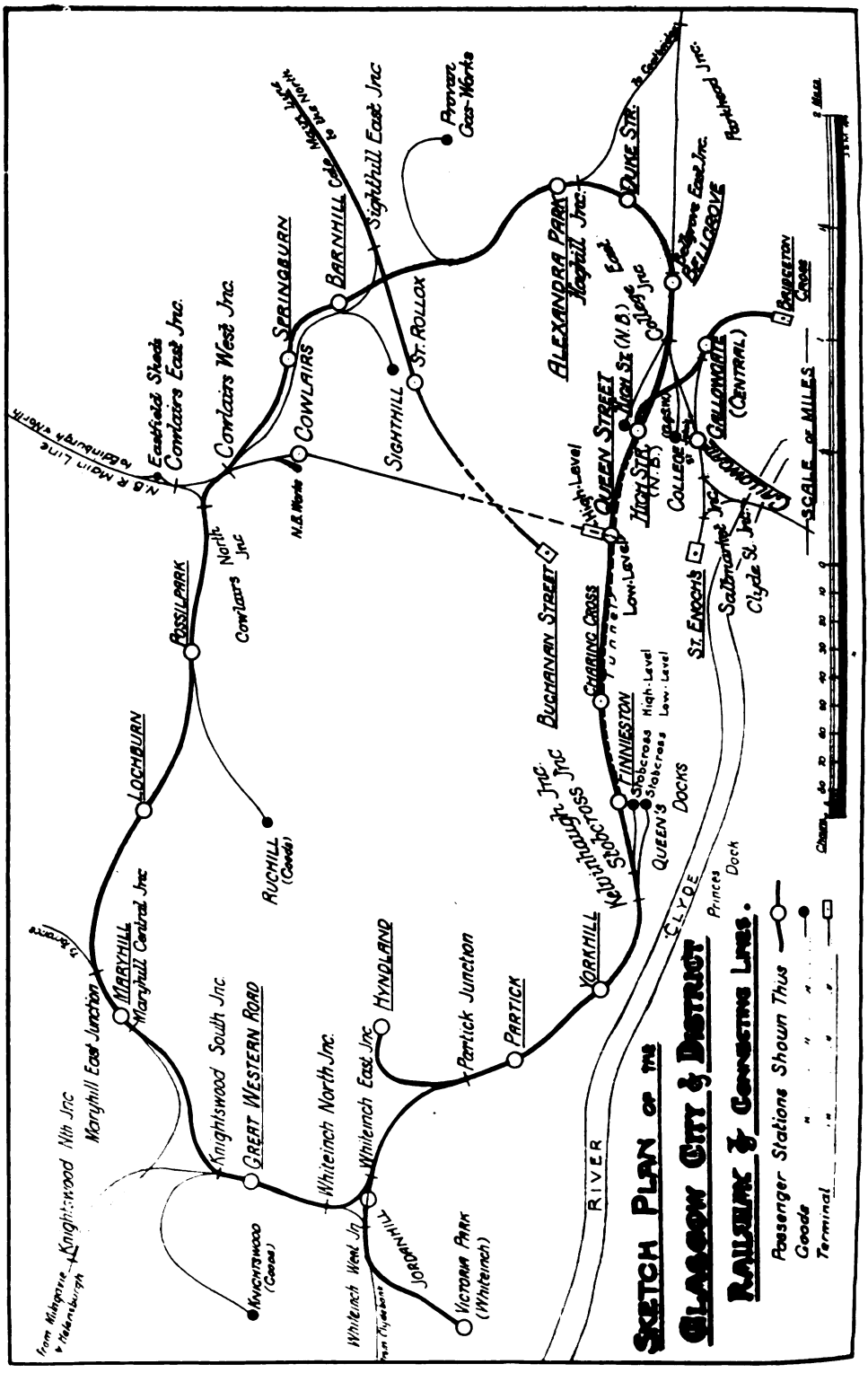
SKETCH PLAN OF THE
GLASGOW CITY & DISTRICT
RAILWAYS & CONNECTING LINES.
Passenger Stations Shown Thus
Goods " " "
Terminal " " "
SCALE OF MILES
RIVER CLYDE
Princes Dock
Docks
Queen's Dock
Stobcross High Level
Stobcross Low Level
Queen Street High Sta. (N.B.)
Queen Street Low Level
Buchanan Street
Charing Cross
Finnieston
Kelvinhaugh Jnc.
Stobcross Jnc.
Yorkhill
Partick
Partick Junction
Hyndland
Whiteinch East Jnc.
Whiteinch North Jnc.
Whiteinch West Jn.
Victoria Park (Whiteinch)
Jordanhill
Knightswood
Knightswood South Jnc
Great Western Road
Maryhill East Junction
Maryhill Central Jnc.
Lochburn
Possilpark
Ruchill (Goods)
Cowlairs North Jnc
Cowlairs West Jnc
Cowlairs East Jnc.
Eastfield Sheds
N.B.R. Main Line to Edinburgh & North
Springburn
Cowlairs
N.B. Works
Barnhill
Sighthill East Jnc
Sighthill
St. Rollox
Provans Gas Works
Alexandra Parade
Alexandra Park Jnc.
Duke St.
Dalmarnock
Rutherglen
Rutherglen East Jnc.
Rutherglen Jnc.
Bridgeton Cross
Bridgeton Goods
Glasgow Central
Central Low Level
College Jnc
College Goods
High St.
St. Enoch's
Saltmarket Jnc
Clyde St. Jnc.
Caledonian Jnc
Caledonian Goods
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principal depôt, connected with the Old Union Railway (of which more will be said presently) near St. John's. Although strictly speaking it is outside the scope of this article, a few facts concerning it may not be considered amiss. It was opened in 1874 and now covers an area of about 17 acres and accommodates over a thousand wagons. It will thus be seen that considerable importance attaches to College as a railway centre, located as it is in the very heart of the city.

And now, having reviewed the venue of our starting point at some length, we are at liberty to commence our journey round the "City and District." This may be accomplished in either direction, trains proceeding from High Street *viâ* Queen Street being designated "Outer Circle" and those in the opposite direction "Inner Circle," according to the respective sets of rails traversed. For the purpose of this article the stations will be taken in the latter order.

A short branch from the main line may be noted just after leaving High Street passenger station. This leads into Bridgeton Cross, in the east end of the city, forming the terminus of virtually all trains on the Helensburgh and Balloch section. The Bridgeton Cross Extension Line was opened in 1892 and is about ¾-mile in length, with one intermediate station, Gallowgate (Central). There are about sixty trains in each direction during the Summer months, exclusive of workmen's trains, and this number is considerably augmented on Saturdays and at the start of the Glasgow Fair holidays, when traffic to the coast is at its height.

The principle adopted by the North British in Glasgow, where separate terminal stations removed a short distance from the main line are provided for dealing with trains to and from stated districts, is a commendable one, as anyone acquainted with the congested condition of the City and District line between Partick and High Street will vouch for. Besides Bridgeton Cross, similar branches exist at Hyndland and Victoria Park, Whiteinch, both in the western part of the city. These will be dealt with in due course. Another station which serves a similar purpose, though further removed from the city, exists at Clydebank (East).

No goods or mineral traffic, except in locomotive coal, is dealt with on the Bridgeton Cross line. It is, however, the principal carriage depôt for the district, and elaborate methods have been introduced for the scientific cleaning of coaches employed on the western section, an interesting description of which appeared in the RAILWAY MAGAZINE, September, 1911. Bridgeton Cross is a station of ample dimensions for the traffic, as accommodation is provided by four platforms and its exterior presents a fine frontage to Canning Street.

To return to the main section of the City and District, 30 chains beyond High Street passenger station is High Street East Junction. This is the point where the North British line is joined by the old City of Glasgow Union Railway. A full and descriptive history of this company appeared in the RAILWAY MAGAZINE for January, 1907, and it is therefore unnecessary to go into details here; but it may be recalled that the line was promoted under the joint auspices of the Glasgow and South Western and North British Railways to link up their respective systems. Including later extensions it ran from Pollok Junction, on the Glasgow and Paisley Joint line, to Springburn, a total length of 7 miles 16 chains, exclusive of the St. Enoch station approach lines, purchased by the Glasgow and South Western company in 1883.

The portion of the Union Railway between Clyde Street Junction (Glasgow and South Western Railway) and High Street East Junction was opened in the early "seventies." There was, and, indeed, still is, one intermediate station—Gallowgate—on it, and in 1893 the Glasgow and South Western Railway opened a short connecting spur line from this point to Gallowgate (Central) on the North British Bridgeton Cross Extension Railway. This enabled trains to run to and from the Glasgow and South Western system and Bridgeton Cross without touching the main North British line and without reversing at College. The Union Railway was worked by both companies up to the year 1896, when a partition of it took place, the Glasgow and South Western taking over that part of the Union Railway south and west of College Junction and the North British the eastern and northern portions. Both companies retained running powers over the whole system, and the actual effect of the change was comparatively trifling. The Glasgow and South Western Company continued to run a service of passenger trains between St. Enoch and Springburn up to September 30th, 1902, but it was thereafter withdrawn and Gallowgate station closed to the public. The latter is now open only

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in the morning and evening for workmen's trains which run daily to and from Govan and Renfrew, when attendance is given by the necessary officials. North British goods and mineral traffic is still worked to and from General Terminus and Princes Dock, on the south side of the river, *viâ* High Street East Junction, as a joint owner with the Caledonian and Glasgow and South Western Companies of the Princes Dock Railway; while two Glasgow and South Western goods trains run daily to Springburn and back. Coaching stock is also regularly exchanged between the two companies by the Union Railway, and football and other "specials" are occasionally transferred between their respective systems, but ordinary passenger traffic, as we have seen, has long since been discontinued.

From High Street East Junction the North British City and District line passes directly under the City Cattle Market, and at Bellgrove elaborate accommodation is provided for dealing expeditiously with an extensive live-stock traffic. Special trains from all parts of the North British system—including places so far away as Brechin and Dunbar—arrive throughout Tuesday night in readiness for the weekly market on Wednesday, while corresponding trains are dispatched to various centres on Wednesday evening.

At Bellgrove East Junction the main line to Edinburgh *viâ* Coatbridge continues due east, and the City and District turns northward to Duke Street station. 20 chains beyond the latter point is Haghill Junction, where a spur-line on the right comes up from the Coatbridge Railway, which we have just left. This branch is 70 chains in length, and is another portion of the old Union Railway, having been constructed to enable goods and mineral trains for Cowlairs from the Monkland district to run thence direct without reversing at Bellgrove. No ordinary passenger trains use the spur, which leaves the Coatbridge line at Parkhead Junction.

Alexandra Park station is next reached, 6 chains beyond Haghill Junction, and adjoining the extensive pleasure-ground of that name. There are few cities so fortunately endowed with parks and open spaces as Glasgow, and the general health and prosperity of its inhabitants must be largely due to this fact. Alexandra Park is of especial interest to the golfer, inasmuch that one of the earliest golf-courses in the Kingdom was laid out here.

Continuing in a north-westerly direction, the railway passes under the Monkland Canal, after which a branch on the right leads to the gigantic Corporation Gas Works at Provan, one of the principal sources of the

Photo.] [*Wohlgemuth & Co.*

BRIDGETON CROSS STATION.

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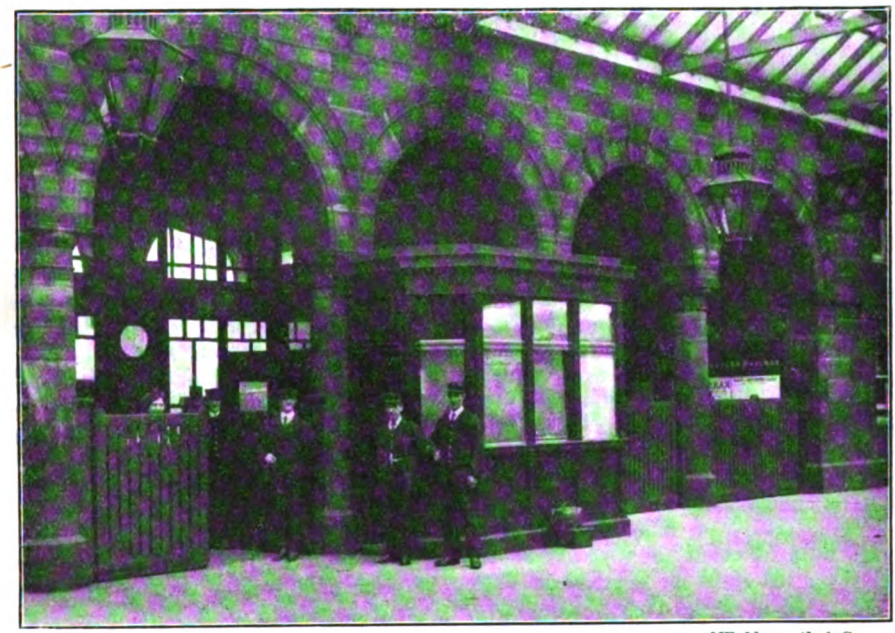
city's light supply. Until four years ago a passenger station—Garngad—existed at the point where this branch leaves the City and District, but it was closed to the public on March 1st, 1910, and the space devoted to additional goods lines and sidings.

The City and District now passes, by means of a short tunnel, under the Caledonian main line from Glasgow (Buchanan Street) to the north, a short distance to the east of St. Rollox, the route of the original Glasgow and Garnkirk Railway, opened in 1831. Emerging from the tunnel, and after passing Barnhill station (2 miles 50 chains from High Street), Sighthill, the principal North British Goods Depôt in Glasgow, may be seen on the left. The Sighthill branch was in existence before the Union Railway was thought of, consequently, when the northern extension of the latter came to be made, it had only to go as far as this point to effect a meeting with the North British line. Sighthill City Union Junction is 9 chains beyond Barnhill station, but the Union Railway also extended onwards for 26 chains to Springburn Junction, where it joined a short North British branch from Cowlairs, 39 chains from the latter place. Separate lines are thus provided for goods and passenger traffic here.

A spur line, used extensively for the interchange of goods traffic, connects the Sighthill branch with the Caledonian Railway, joining the latter at Sighthill East Junction. Previous to the opening of their own underground line, the Caledonian Company could only gain access to the docks at Stobcross by means of this fork, whence they exercised running powers over that portion of the North British City and District now to be followed. One mineral train runs daily at the present time from Sighthill East Junction to the Knightswood Branch in virtue of these powers.

Springburn station, City and District, is situated in the midst of a hive of engineering industry, and resounds all day to the clang of the hammer. What visions of locomotive giants the mere mention of such famous names as the Atlas and Hyde Park Works conjure up to the railway enthusiast! The former are on the right, and the latter on the left, just before entering Springburn station from the south.

After this, Cowlairs is reached almost immediately, and the Edinburgh and Glasgow main line is joined at Cowlairs West Junction, only, however, to be left again immediately as we break away to the left. This brief mention of the home of the North British "Iron Horse" must accordingly suffice, as Cowlairs station itself is situated a short distance down the main line towards



Photo] [*Wohlgemuth & Co.*

BRIDGETON CROSS STATION (EXTERIOR).

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the south, beside the large locomotive and carriage shops of the company.

Looking in the opposite direction before we leave the main line, Eastfield Engine Sheds, the principal "stables" for the Western District, may be seen on the right, almost opposite Cowlairs East Junction.

The route now followed by "Circle" trains on the City and District is that of the old Helensburgh Railway. Prior to the opening of the underground portion of line between High Street and Stobcross all trains from and to the Helensburgh section arrived at, and departed from, Queen Street (High Level) station, Glasgow. The only through trains which now do so are those serving the West Highland Railway, of which there are four in each direction daily in summer, and two in winter. A short spur line between Cowlairs East and North Junctions completes a triangle of which the Edinburgh main line is the base, and enables trains to run direct from the latter to the Helensburgh railway without going into Cowlairs and reversing. It is only used for special passenger traffic, but a large number of goods and mineral trains traverse it daily between Stobcross and Cadder Marshalling Yard, near Bishopbriggs. At Possilpark station, 50 chains from Cowlairs North Junction, a short branch diverges on the left to Ruchill goods depot, in the eastern district of Maryhill. The Lanarkshire and Dumbartonshire section of the Caledonian Railway, and, immediately beyond, the Forth and Clyde Canal, are then passed under and thereafter Lochburn station, on the northern outskirts of the city, is reached. Nearly a mile further on, at Maryhill East Junction, the City and District is joined on the right by the Kelvin Valley Railway, which comes from Kilsyth *viâ* Torrance. Here, it may be remarked, we have now practically completed half the circuit of the City and District, the distance to High Street being about 6 miles either way. This is also the northern limit of the line, which now runs in a south-westerly direction skirting Maryhill The North British station here is almost a mile distant from that of the Caledonian Railway.

Maryhill Central Junction marks the parting of the City and District from the main line, which continues due west to Dumbarton, Helensburgh, etc., *viâ* Drumchapel, while the former diverges to the left and runs south over what was originally the Stobcross Railway. This line was constructed towards the end of the "seventies" to afford communication with the docks on the northern side of the Clyde. The Forth and Clyde Canal is passed under for the second time before reaching Knightswood South Junction, 7 miles 7 chains from High Street by the route which we have traversed. A connecting fork line from Knightswood North Junction on the Helensburgh railway, which we have just left, enables trains from the latter to run to the Stobcross district. This is the route of all passenger trains between Helensburgh and Bridgeton Cross, Springburn, etc., which run *viâ* Drumchapel and Queen Street (Low Level, but there is an alternative route which will be noted in due course. Mention must be made here of the Milngavie branch, to and from which a large number of the City and District trains run. Milngavie is an increasingly popular picturesque suburb about 8¼ miles from Queen Street (Low Level) direct, and one which has found considerable favour with the Glasgow city man in recent years. The branch line, which leads to it, leaves the Helensburgh Railway 32 chains west of Knightswood North Junction, where a new station named Westerton was opened in August last. The latter has been designed to serve a new "Garden Suburb" of that name, which is now being laid out on the most approved principles, and is served by nearly all the Milngavie branch trains, as well as a large number of Helensburgh locals.

Returning to the City and District, Great Western Road station is next reached, 12 chains from Knightswood South Junction, and a mile from Maryhill. It is situated above the level of the street at the extreme end of this famous boulevard, which runs perfectly straight almost into the heart of the city, a distance of nearly three miles. Lined the best part of the way with stately mansions, the residences of Glasgow's *elite*, the thoroughfare presents a striking picture on a fine afternoon, and no visitor should fail to take a tram-ride out its entire length.

(*To be continued*).

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Leaves from the Log of a Locomotive Engineer [No. XXI.].

By ROBERT WEATHERBURN.

IN May, 1885, I received my appointment as District Locomotive Superintendent at Kentish Town, London, *vice* Mr. John Hanbury, a well known and highly respected engineer who had been appointed engineer to the Metropolitan Railway. This was my third removal in little over four years, namely, Liverpool, Leicester, and London. Every change of personnel and staff means not only taking up the reins just laid down by your predecessor, but also close and careful study of the officers and men brought under your control. As regards the former some can be calibrated at a glance, with others it is a work of years before a just estimate can be formed. Some lose, others gain by lengthy acquaintance.

The artisan can be speedily estimated by the quality of his work, the labourer by his diligence, the drivers and firemen by the care and attention given to their engines and more or less freedom from accidents and vexatious reports. One admirable feature peculiar to well-managed lines, and alike applicable to salaried officers and the running staff, is the Pedigree Book, which records the date of entry into the Company's service, promotions, rewards, fines, suspensions, admonishments and cautions, with the nature of the offence or act fully stated, during his career.

This indispensable book, although helping materially to a better knowledge of the men, and invaluable as a reference when investigating or making rewards, is not to be considered as infallible or to be used in an arbitrary sense. The first duty of any official, particularly when responsibly placed, is to enforce a strict observance of the rules and regulations of the service. These laws are the outcome of years of experience, solicitude and care, and are framed in the joint interests of the public and the Company. Their observance tends to the moral and physical benefit of the men. Their enforcement, however, should be qualified by a regard for the circumstances, and the man. Drafted from every phase of life, some men are readily amenable, others, if not ignorant of their meaning, fail to see the need or justice of what appear unnecessary or irritating restrictions, and, when the opportunity occurs, do not hesitate in their infraction. Then there are those who, both in personal habit and performance of duty, are careless and negligent, and unless checked soon demoralise the younger hands. Generally these failings are the result of early environment, the only successful treatment of which is the inculcation of new habits, by exacting the observance of the smallest trifles without irritation.

A man of untidy and dirty habits, when surrounded by all that is scrupulously tidy and clean, feels so uncomfortable and out of place that he gradually and surely adapts himself to the new order of things, and in doing so, however reluctantly, in time not only becomes a proselyte but an advocate as well.

It may seem personal and superfluous to speak of official duties and their performance. I have found that the true estimate of such is not alone in carrying out the daily round in strict accordance with the rules and regulations of the company, but, at the same time, trying in every way to elevate the tone and character of the work, thus arousing a personal interest and pride in doing it. The service, like that of the army or navy, is recruited from nearly every grade of society, each man bringing with him the good or evil habits of his earlier surroundings, but all more or less desirous of becoming drivers. The test of his suitability is, necessarily a lengthy one, and involves a trying period of probation as cleaner. In order to render this novitiate a success the youth must be encouraged and taught that it is needful, and that the work must be thoroughly done. The task in bad seasons is almost sisyphean. The engine, turned out clean and sprightly, a credit to himself and the company, and a pride to the driver, is returned to him bespattered with dirt, grease, and weatherbeaten, day after day,

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week after week, with a cruel and trying monotony that either makes or mars the man. No mere sense of duty is enough to keep him up to the daily average required, only the personal pride and interest, strengthened by the feeling that the engine, in smartness and appearance, represents his particular contribution. When this feeling, judiciously stimulated, has taken root, the man's feet are securely placed on the next rung of the ladder, and the Company has a creditable unit for further training.

From the commencement of my official career, I had strenuously enforced those unwritten rules which, although for a time producing opposition and even unpopularity in some cases, yet eventually bring about satisfactory results. The strict inculcation, by example, of order and cleanliness as a system, may not for a time appear more than a fad, and be treated by some as of no more value than "spit and polish" in the navy, but its effect on the development of character is of the highest and most vital importance. Whatever the private surroundings of the man may be at home, and however closely they may cling, he finds himself bound to conform to his working hours of environment. Everything necessary to high efficiency is associated with cleanliness. Order cannot be maintained without its practice, nay, his own personal appearance is improved by association with it. The necessity of keeping the machinery satisfactory, under his charge as a cleaner, carries with it the qualification for advancement. No less as fireman is it incumbent to do the same, as the engine armature requires an occasional rub here or there, as well as the cleaning out of smokebox, ashpan, and gratebars. Still further, this (what some would term unnecessary cleanliness) often reveals defects, flaws, or incipient fractures, of greater or less importance. Yet the moral effect is still greater, for the individual, whether liking it or not, feels himself under inspection, and begins to realise that he must be circumspect in small things as well as great, and henceforward he is on the way to become a serviceable and economical servant of the Company. Some may think that this discipline may be carried too far; others, that the results are not in proportion to the expenditure. To those I would observe that the effect follows the man through his whole career, and is constant; and that cleanliness and order, once obtained, are easily maintained. When the pound of waste is well used, the pound of coal will not be abused. There is another side to be considered, namely, the official one, with its obligation to the men, and this is equally important in order to consolidate and bind together and prove how needful the one is to the other.

THE LATE MR. JAMES GRESHAM.

The important work done by this gentleman in reference to the development of the Vacuum Brake and other locomotive and train-working appliances, was dealt with by Mr. Weatherburn in the May RAILWAY MAGAZINE.

A case in point may not be amiss to show some of the results. The men working many ordinary and special trains are required to lodge out at the end of the journey. If lodged on premises provided by the Company the sum of 1s. 6d. was allowed per night, if at private lodgings 2s. 6d. Men from the provinces, Leeds, Manchester, Nottingham, or other large towns, working into London were naturally open to the hundred-and-one attractions of the great Metropolis, and made the most of their opportunities when there, the results in too many instances being loss of rest, or late to trains, or even worse. I may here remark that the Company

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insists on eight hours rest. In order to ensure this object, and keep the men under proper supervision, it was at last decided to build a special lodging house or barracks controlled by a steward, in telephone touch with the depôt. The barracks were fitted up with separate cubicles and beds, reading and dining rooms, and last, but not least, bath rooms, soap, towels, and hot and cold water. In every respect the conveniences and management were equal to those in second class hotels. To many of the men from colliery and other country districts the change was almost palatial, when contrasted with the want of conveniences they experienced at home.

For a time after the opening the baths were but sparingly used, but the sight of the smart rooms, clean bed sheets and counterpane, all in trim and dainty order forced the suggestion that a preparatory bath was necessary before using.

The result was so satisfactory that I can truthfully assert that the beds, after several days use, would bear comparison for cleanliness with the linen of the best hotel for the same time, and during the years that I supervised this establishment not one complaint of misuse or vermin came under my notice. But further good resulted, for I had it on unquestionable authority that many of the men who built houses for themselves or through the medium of building societies, insisted on the bath room as a needful adjunct. Besides, those who had slatternly wives forced their pace in the way of imitating the cleanliness and order that they had been accustomed to at the barracks. Having dealt so far with those influences which trim and shape the rough material into satisfactory and self-respecting and respected men, there still remains the question of preparation and selection for the higher and more responsible duties required of enginemen. It will be understood that my references are more particularly to that class.

Promotion by seniority is the rule up to a certain extent; its general application, if practicable would simplify and lighten official responsibilities greatly. But unfortunately, or fortunately, all men are not equally capable, hence the close supervision and discrimination required in order to safeguard the public and the Company's interests, which in these things are identical.

The stages of promotion are as follows :—

1. From cleaner to passed cleaner, that is eligible for fireman's duty when required.
2. From passed cleaner to fireman.
3. From fireman to passed fireman, that is eligible for ordinary driver's work when required.
4. From passed fireman to driver.

The two last are qualified by actual test and inspection.

So far promotion by seniority is carried out, but although passed and certified as qualified for ordinary driving, many lack those qualities necessary to first-class driving. Some never realise the responsible nature of their duties, and go wrong. Others fail by overestimating them. Many are physically unable to bear the nervous strain entailed by speed and concentrated effort. Again, others, in every other way competent, have not the moral rectitude, or in other words cannot be depended on to keep straight.

Any attempt to carry out promotion by seniority other than that shown would be followed by most unfortunate results. The selection of the fittest therefore suggests itself as a rational solution, and success follows in proportion to the care and judgment exercised. The qualifications necessary

MIDLAND RAILWAY LODGING HOUSE AT KENTISH TOWN FOR ENGINEMEN, AND PORTION OF GROUNDS.

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ONE OF THE CORRIDORS LEADING TO THE CUBICLES: MIDLAND RAILWAY COMPANY'S ENGINEMEN'S LODGING HOUSE.

for such judgment and selection on the part of officials, are, a thorough acquaintance with the actual duties required, and of the capabilities and character of the candidate, supplemented by the silent but eloquent testimony of the Pedigree Book. These, further strengthened by encouraging a constant healthy competition and friendly rivalry, are in the end sure to promote all-round excellence.

Yet some (the Unions particularly) maintain with bitterness that the principles of seniority should be carried to the fullest extent, even to the employment of the deficient. I can only aver that a railway worked on such socialistic principles, even after the most Procustean manner, would be followed by disaster. With a railway like the Midland, whose training and discipline leave little or nothing to be desired, it is an impossibility, even with the most assiduous application, to mould and develop a status that shall be alike satisfactory, and justly applicable to all the other companies or corporations. Let it be understood that, with the restrictions of gauge, height of tunnels, width of platforms, etc., the English engineer has his work cut out to meet the maximum demands made upon him by competition, and the further demand for increased economy, so that bad weather, or any other unexpected thing, acting as an adverse factor, will often make the conditions of power on the one hand, and resistance on the other, so nearly equal that little margin appears left.

The competent driver with the right grit will then rise equal to the occasion and rejoice and take pride in having, by dint and application of the human factor, come successfully through. A man with less grit and fewer expedients fails, and excuses himself on the ground of bad weather, heavy trains, etc. The conditions being equal, with some men an engine will be a great success, with others as great a failure.

Some men, by sheer skill and energy, will get one half more work out of an engine than another, and with less punishment to machinery. Such men, although admired and secretly envied, are unpopular with their fellows, as what they accomplish with ease and pride of place, with a man less endowed becomes a stress and worry. The personal factor is by no means a negligible quantity on a railway, and should be fostered and encouraged in order to obtain satisfactory results. At one time there was a secret understanding amongst a great many of the drivers of passenger trains that, should a train consist of more than a certain number of vehicles, a pilot engine should be requisitioned. In many instances such trains did not average more than two hundred tons. Now this involved nearly double the cost of haulage, and opened the door to many risks and misunderstandings as to responsibility of signals and application of brakes. From the commencement of my appointment it became an anxiety and personal study to break through this understanding, and in order to pave the way I determined to have the locomotives in such an efficient condition that no man could complain, without good cause, of the machinery placed at his disposal.

At the same time I deemed it necessary to appeal to the innate pride of place and duty which every good man at heart esteems. The difficulties were greater than I imagined, as diverse opinions existed as to what were considered reasonable loads at the booked speed, and departmental opposition was added to that of the men. Nevertheless, a careful selection of promising junior men, whom I knew to possess the qualities needed, introduced into the hitherto exclusive rings of duties, proved soundness of judgment in this respect.

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Still years of opposition had to be encountered, not only, as formerly stated, by the men, but also officially. Happily the time came when the exigencies of the service forced official recognition and carrying out of the scheme more extensively, but it would never have been a success had not selection of the fittest been the policy eventually pursued.

The reader must not, however, suppose that double-headed trains were abolished entirely, but at least sixty-five per cent. were. There will always be assistant engines needed at special times.

However far reaching and close-applying the rules and discipline of a company may be, there are agencies constantly at work tending to neutralise them, drink being the principal one. It is a deplorable fact that some men have two distinct personalities. Outside the company's gates, free from restraint, he takes his glass in moderation, or the contrary; once inside the company's domains he knows he is under observation.

Beer, or any other intoxicant, is forbidden on the premises. He must be in a sober condition when signing on duty, and in order to prevent any infraction a clerk or some responsible individual witnesses such signatures, and is compelled to report to his superior officer anything of an irregular or suspicious character. Further, the foreman on duty is expected to see each man personally before taking out his engine. Even when away from his depôt, he is liable to be reported by any officer of other departments, should he fail in his duty.

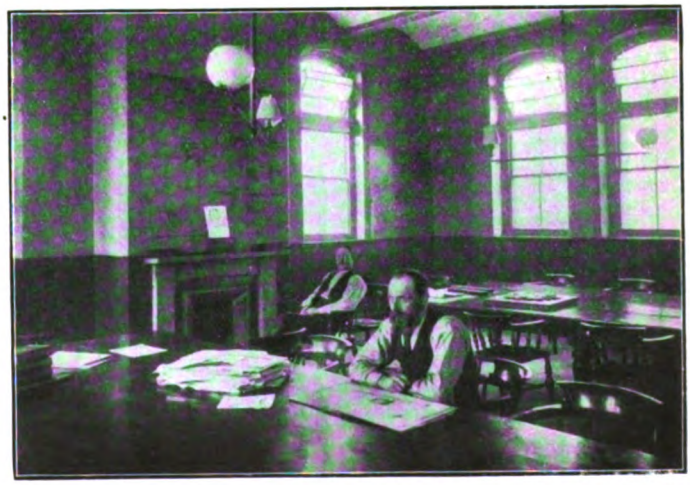
Despite these precautions men do run the gauntlet, and are only discovered by blundering, or incapacity. Unfortunately, capable men in every other respect sometimes come to grief, for the means and ways of obtaining drink are numerous and secret.

One such out of a number:—Driver "H" came on duty sober as testified by witnessing clerk, foreman and others with whom he spoke. His signature, clearly and well written, was corroborative. His time was fully accounted for until he took out his train, an express passenger.

Some thirty odd miles out the train slowed down and came to a stop for want of steam. He was found incapable through drink. It was afterwards ascertained that on the morning in question, on his way to the sheds, he had called in for a glass, and met some old friends who had persuaded him to drink a glass with each, somewhat hurriedly, the effect of which was not in the least apparent when signing on, but which, when running at high speed, took effect.

Others secrete drink upon their person. One of the most painful cases I had to deal with was that of express driver "W.," who had been fined and reduced to shunting work for getting drink when on duty. In every other respect a most respectable and competent man, he felt his reduced position keenly, and at the expiration of nearly a year asked that his case might be reconsidered with a view to his reinstatement on passenger train duty.

He was refused. His "Society" then, through several of his fellow members (drivers), made application on his behalf, instancing the severe punishment he had received, and its deterrent influence. Moved by the number and character of these intercessions, he was at last fully reinstated as express driver. Nearly two years had then elapsed since he had been on the main line, and as several signal alterations had been made in the meantime it was considered advisable that he should go as third man on the footplate for a couple or three days, so as to thoroughly revive his knowledge of the road.



IN THE READING ROOM: MIDLAND RAILWAY COMPANY'S ENGINEMEN'S LODGING HOUSE.

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On the second day, I had a telegram instructing me to suspend him at once. My consternation was immense, when I heard that he had taken a bottle of drink with him and had insisted on the driver and fireman drinking to his success. Still worse, the train in question being a heavy one, and therefore double-headed, in order to still further show his good fellowship he had clambered over the tender of the leading engine when at full speed to give the men on the engine behind a share of the liquor.

How he had obtained the drink was never known, but the feat of clambering over from one engine to the other, with a bottle in one hand, and contending with the erratic and diverse movements produced by high speed, can only be partially understood by anyone trying it with both hands. At least it was an acrobatic feat. Such cases as the foregoing are happily rare, indeed, as the reader will have grasped, their very rarity has caused me to instance them.

Few have had better opportunities than myself, of gauging the capabilities of main-line drivers, and no one more ready to bear ungrudging testimony to their general high qualities. Thanks to the discipline, administration and machinery, the statistics of English railways as regards fatal accidents enjoy a position unattained by any other country.

Still it is needful to point out that though guarded, and protected, as far as human judgment can forefend, the unexpected in the human factor may occur which for the moment upsets the wisest calculators. The question often obtrudes itself whether the many automatic safeguards provided are the unquestionable advantage claimed? The men have become so accustomed to depend on their accuracy and reliability that their own otherwise quick intelligence has become impaired by disuse, so that when called upon unexpectedly they are found wanting. Certain it is that although the accidents are fewer, those that do occur are of a much more severe character, and in too many cases are traceable to want of judgment at critical moments, which goes to prove that after all the human factor is everything.

(*To be continued.*)

Photo] [*F. E. Mackay.*

GREAT NORTHERN RAILWAY.

Down Sheffield Express passing Potters Bar.

4-4-2 Locomotive No. 1404.

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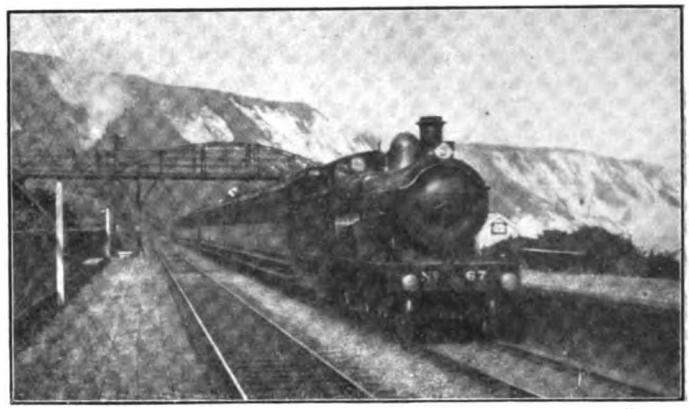
The Continental Services of English Railways.

I.—THE KENT PORTS ROUTES.

By DENIS O'DONOGHUE.



Photo] [*Lieut. B. D. Holberton.*

UP CONTINENTAL TRAIN PASSING "THE WARREN" HALT; 4-4-0 LOCOMOTIVE NO. 67.

TO-DAY there is an abundant choice of routes from England to the Continent, and the selection of one or other is largely governed by the convenience of associated journeys, consideration of over-sea routes, and time of starting. The services most used between England and the Continent are those of the South Eastern and Chatham Railway, either by way of Dover and Calais, Folkestone and Boulogne, Dover and Ostend, Queenboro' and Flushing, or Folkestone and Flushing. The major part of the Continental passenger traffic flows from and to, or *viâ* London and Paris, so that the lion's share of the business naturally falls to the South Eastern and Chatham Railway's routes, which afford shorter sea crossings and a larger number of daily services than other routes. The bulk of the heavy all-the-year round traffic between London and the Riviera, Switzerland, Austria-Hungary, Spain, Portugal, and Italy also passes either *viâ* Dover-Calais or Folkestone-Boulogne, with a portion *viâ* the Ostend and Flushing routes, and the extra holiday and excurison traffic during the months of July and August necessitates the usual accommodation for travellers being oftentimes duplicated and sometimes triplicated, transposing the normally busy scenes into unexampled sights of activity.

The Dover and Folkestone routes are beloved by the novelist, whose villains fleeing from justice, and happy honeymoon pairs, invariably make for the Continent by one of these ports: and who has not read in sensational novels of the King's messenger carrying State documents of vital importance being shadowed by the clever spy who, suitably disguised, joins the same boat train at Charing Cross or Victoria as his intended victim.

Year by year sees the South Eastern and Chatham Company's Continental service improved, and to-day the Company can advertise the journey from London to Paris *viâ* Dover and Calais as occupying only 6¼ hours, while the Riviera is reached in a little over 24 hours. One may leave Charing Cross at 4.30 p.m. and arrive in Paris at 11.0 p.m.; sleep in Paris and, leaving the Gare Lyon at 9.0 a.m. the next morning, arrive at Cannes at 10.17 p.m., Nice at 10.58 p.m., Monte Carlo at 11.38 p.m., and Mentone at 11.56 p.m. Four services daily are given *viâ* Dover and Calais the boat trains leaving London at 9.0 a.m., 11.0 a.m., 4.30 p.m. and 9.0 p.m. Three of these are 1st and 2nd class only and in connection passengers arrive in Paris at 4.40 p.m., 6.20 p.m. and 11.0 p.m. respectively The 9.0 p.m. train from Charing Cross is 1st, 2nd and 3rd class and carries the mails, the connecting train from Calais reaching Paris at 5.40 a.m. *Viâ* Folkestone and Boulogne two services are available, the trains leaving London at 10.0 a.m. and 2.5 p.m., both carrying 1st, 2nd and 3rd class passengers. Travellers by the 10.0 a.m. train from Charing Cross *viâ* Boulogne arrive in Paris at 5.20 p.m., and first and second class passengers by the afternoon train at 9.0 p.m., whilst third class passengers reach Paris at 11.5 and this train will after June 15th be accelerated to reach Paris at 10.35 p.m. Pullman, parlour and buffet cars of the latest design are running in the 9.0 a.m., 10.0 a.m., 11.0 a.m., 2.5 p.m., and 4.30 p.m. boat trains from London to Dover or Folkestone, for the use of 1st class ticket

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holders. Corresponding services are given in the reverse direction.

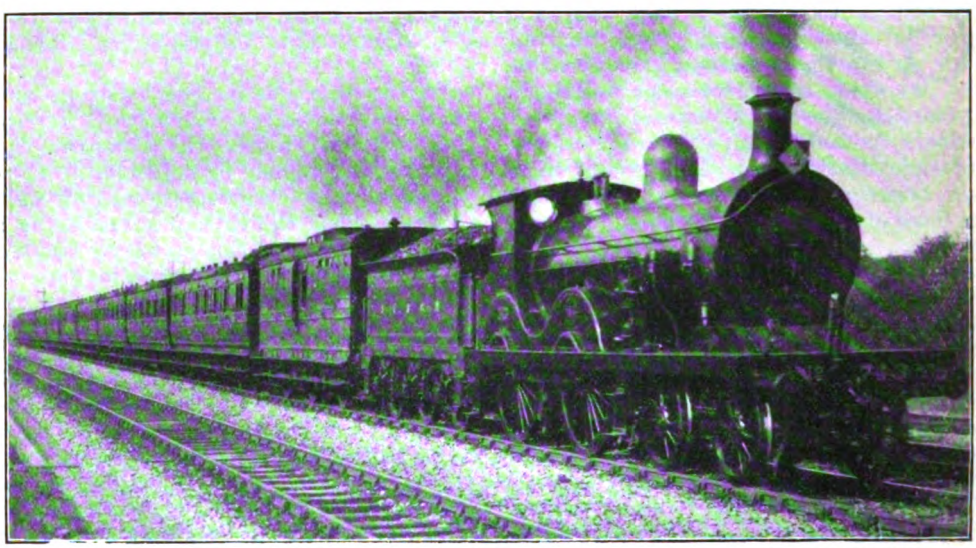
The route *viâ* Dover-Calais is a favourite one for the country of the Rhine and Southern Germany, and is also patronised by travellers for Belgium, and other parts of the Continent, as well as by passengers for the Far East *viâ* the Trans-Siberian Railway. In addition to the passengers with European destinations, many people for Africa, India and the East by sea prefer to join the liners at Marseilles rather than start the voyage from an English port, and for this purpose travel to Marseilles *viâ* Dover or Folkestone and Paris.

The large volume of passenger traffic passing through Dover and Folkestone can be well appreciated by a reference to the table of fares from London shown in the South Eastern and Chatham Railway Company's Continental time-tables, which includes through fares to places as remote and far apart as Genoa, Naples, Venice, Rome, Trieste, Stockholm, St. Petersburg, Moscow, Warsaw, Vladivostock, Nagasaki and Shanghai, as well as to the principal cities and towns of France, Belgium, Holland, Germany, Austria, Hungary, and the pleasure resorts of Switzerland and the Tyrol and watering places of Germany.

The South Eastern and Chatham Company was the first Railway Company to utilise the Parson's turbine engines for steamers, *The Queen*, constructed for the Dover-Calais sailings being the experimental vessel. Now the whole of the Company's steamers carrying passengers are triple-screw turbine engined boats, with wireless telegraph equipment. The *Riviera* and *Engadine*, the latest boats, are of 8,100 indicated horse power, 1,675 gross tonnage, and are capable of steaming 23 knots an hour. The other five are of 7,500 indicated horse power, varying from 1,676 to 1,695 gross tonnage with a speed of 21·76 to 22·50 knots per hour. These steamers have all been constructed by Messrs. Denny Bros., at Dumbarton.

For dealing with the merchandise carried between England and France, the South Eastern and Chatham Company has a fleet of seven twin-screw and one single-screw steamers, five of 1,300 to 1,425 tons and three of 700 tons, the larger vessels steaming 15½ knots an hour and the smaller 10½ knots an hour. These ships are of pre-turbine days, and with the newer passenger boats bring the Company's fleet up to a total of 15 steamers.

Besides the Channel crossings made by their own boats, the South Eastern and Chatham Company works a Continental traffic in conjunction with foreign-owned steamers sailing to Ostend from Dover and to Flushing from Folkestone and Queenboro' (Isle of Sheppey). On the Dover-Ostend route steamers sail thrice daily, giving services to Belgium, Switzerland, Italy,



Photo] [*F. E. Mackay.*

DOWN OSTEND BOAT TRAIN; 4-4-0 LOCOMOTIVE NO. 743.

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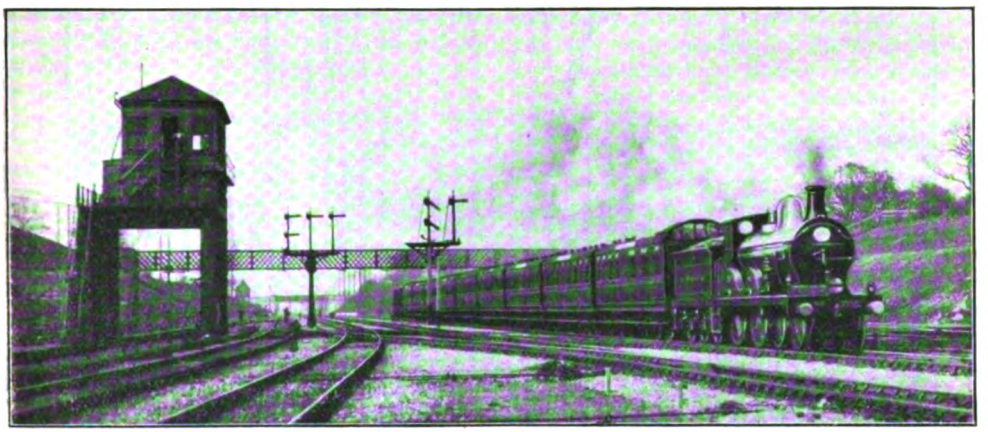
North and South Germany, Austria and Russia. Trains leave Charing Cross at 9.0 a.m., 2.5 p.m., and 9.0 p.m., in connection with the Ostend boats which leave Dover Pier at 11.0 a.m., 4.15 p.m., and 11.0 p.m., and perform the sea passage in from 3 to 4 hours. In the reverse direction the service is on similar lines. The steamers, constructed by Messrs. Cockerill & Co., a Belgian firm of English origin, are luxurious and up-to-date ships, fitted with wireless telegraphic apparatus, electric light and the latest improvements. The five new vessels built by order of the Belgian Government in the yard of the Cockerill Company are constructed entirely of steel and are driven by three compound steam turbines, one for high pressure and two for low pressure. To the same shafts as the latter are fitted the turbines for reverse motion, and these



FOLKESTONE BOAT EXPRESS APPROACHING ORPINGTON.

are capable of giving the vessels a backward speed of 16 knots, and enable them to be pulled up very quickly, even when steaming at top speed. The boats, in point of beauty and elegance, remind one of a transatlantic liner; they can steam 21-24 knots an hour and can each carry one thousand passengers, for all of whom there is covered accommodation in bad weather. An innovation in the equipment of channel steamers is the powerful electric searchlight fitted on the bridges of these boats. The two latest boats, launched last year, are provided with Frahm anti-rolling arrangements which almost entirely prevent rolling.

The Flushing route is served by a morning boat daily from Queenboro' and a night boat daily from Folkestone, the boat trains leaving Victoria at 10.0 a.m. and Holborn at 9.55 a.m. for Queenboro' and at 8.30 p.m. and Holborn at 8.25 p.m. for Folkestone. The services are 1st and 2nd class only, and by this route direct communication is established with the principal Dutch towns, Belgium, Germany, Austria-Hungary, Russia *viâ* Berlin, and with the Trans-Siberian trains from Moscow for China and Japan, the journey to Japan from London occupying thirteen days. The Folkestone-Flushing service is the quickest from London to North and South Germany.

The steamers of the Zeeland Steamship Company on the Flushing route, built by the Fairfield Shipbuilding & Engineering Company at Govan, near Glasgow, are the largest vessels employed in the Channel service. They are constructed of steel throughout, lighted by electricity, and fitted with wireless telegraph apparatus and submarine bell-receiving apparatus. The day boats from Queenboro' Pier are so constructed that unusual comfort is available on deck. A spacious promenade deck, which contains a comfortable deck-house with verandah and an upper deck with a large deck-house in which are the smoking-room and lounge, enable passengers to enjoy the easy sea trip made in these steamers. For the night crossing from Folkestone the arrangement is suitably altered, the cabins and sleeping accommodation being the first charge on the space.

The trains between London (Charing Cross or Victoria) and Dover and Folkestone are now composed of special rolling stock, including semi-saloon vehicles for both first and second class passengers, and adequate lavatory accommodation for the

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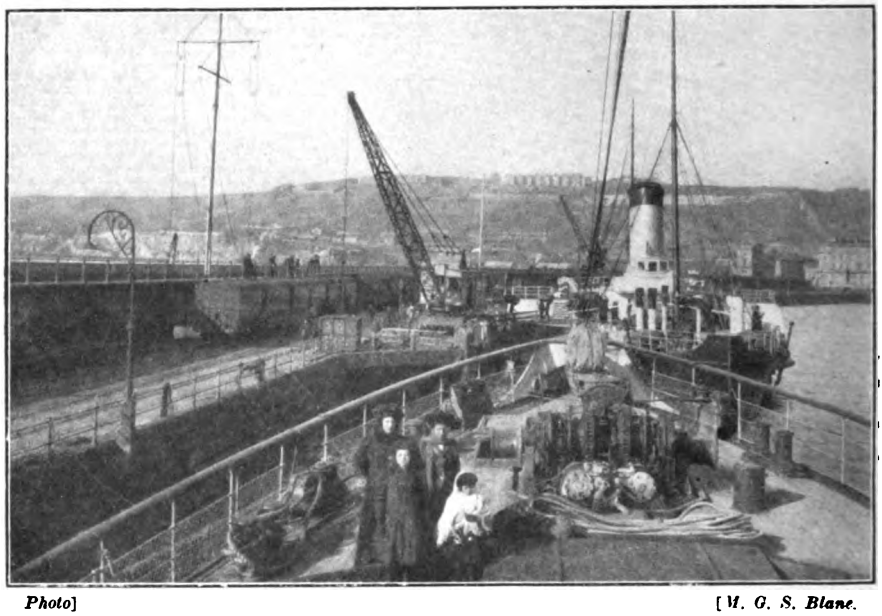
ordinary compartments, the whole equipment of these trains being essentially up-to-date. Virtually all the day services also include one, two or three Pullman cars, specially built for this work by the Pullman Car Co., and these are always well patronised. A small supplementary fare is charged, additional to the first class rates, and seats can be reserved, not only in London, but also on the boats when crossing for the homeward journey, instructions being often telegraphed by means of the wireless apparatus installed on most of the boats. Usually one of the Pullman cars is a buffet vehicle, or is adapted for serving breakfast and dinner, and this applies to the Folkestone-Flushing service as well as those for



Photo] [*M. G. S. Blanc.*

THE MORNING BOAT LEAVING THE ADMIRALTY PIER (BEFORE RECONSTRUCTION) FOR OSTEND.

the Dover-Calais and Folkestone-Boulogne routes. Across the channel, the trains are also well equipped, including various types of special vehicles and the well known cars operated by the International Sleeping Car Company, on the principal trans-Continental and special services.

The South Eastern and Chatham Railway while primarily concerned in English traffic for Central and Southern France, Switzerland, Austria-Hungary, Italy and the German States *viâ* Dover and Folkestone, is interested in a growing business arising out of the development of the numerous sea-side resorts dotted along the French coast from the Belgian frontier to the mouth of the river Somme, and thence south to Le Tréport, situated in the political departments of Pas-de-Calais and Somme coincident with the old province of Picardy. Only 3½ hours from London the coast of Picardy provides a lavish variety of holiday resorts with an exhilarating and dry climate, and possessing attractions to suit all tastes and ages. For a long time past the sea-side places on this stretch of coast have drawn year after year English families who have been regular patrons from the day of their first visit, and French folk domiciled in England who miss no opportunity of spending an enjoyable and healthy holiday in the land of their birth, but it is only of late that the accessible coast of Northern France has developed as a favourite ground for holiday making with British tourists.

Boulogne is more central than Calais for the Picardy coast and visitors to Audresselles, Ambleteuse, Wimereux and places south of Boulogne should use the Folkestone route. Before the cliffs of Kent have entirely faded from view, the verdant slopes of the French coast are visible, and the first conspicuous object to be seen is Wimereux, showing white in the sun's reflection (if the sun be shining) on the port bow. The dome of Boulogne Cathedral is soon seen

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directly ahead, and in a very short time the steamer enters the harbour and berths on the south side of the river. Travellers to the Picardy coast towns proceed from Boulogne Ville (Town) station; those for Wimereux, Ambleteuse and Hardelot have the choice of proceeding from Boulogne by electric tram. The Calais boat is more convenient for passengers to Sangatte, Loon-Plage, St. Pol-sur-Mer, Dunkirk and Malo-les-Bains.

Among the fifty or more sea-side places adjacent to Boulogne and Calais, the visitor, even of the most exacting and fussy nature, can select one to suit his mood, whatever it may be, and can conveniently and pleasantly visit almost any other spot on the coast in the course of a day's trip. Whichever he chooses he can be certain of first-rate accommodation for all classes at prices most moderate, bracing air and perfect bathing conditions. The resorts on the coast of Picardy all have fine, firm, golden sands without any shingle, thus giving facilities for sea-side cricket, tennis and croquet besides splendid bathing. The search for either a gay place or a quiet retreat offers no trouble. At many of the larger Picardy resorts the most exacting requirements for a diversified programme of organised entertainments for children and adults are amply provided for. There are fêtes, carnivals, regattas, lawn tennis and golf tournaments, sports and fêtes de la plage; operatic and variety entertainments and concerts, and the casino.

Boulogne with a population of 53,000 and an English colony of 500, is probably the most visited of foreign towns by British tourists and trippers, many hundreds of whom cross the Channel at holiday times to spend a few hours in the gay holiday and fishing town, and drop a few francs at petits-chevaux in the handsome casino. Boulogne, which is not now a bishopric, having been absorbed in the diocese of Arras, is rich in historical interest. Here the great Bonaparte commenced to gather his army for the invasion of England, frustrated by Nelson's victory of Trafalgar, which scattered the fleet intended to transport the troops to the English coast. Wimereux, a fashionable resort with a casino and a fine sporting golf course, and Hardelot, a pretty place in a well wooded country are close to Boulogne and are easily reached by train and tram. Hardelot has grown greatly during the past five years, and now owns one of the finest marine promenades on the coast, a first class golf course and electric light. The Duke of Argyle owns a villa there, and many well-known French and English visitors make it their haunt in summer. Blériot the first aviator to fly the Channel has established a school of aeronautics at Hardelot. Many golfers using the Hardelot links, make their headquarters at Pont-de-Briques, a pretty village with many well appointed but modest hotels and inns.

Le Touquet-Paris-Plage the gayest and most fashionable of the Picardy sea-side resorts is becoming very well known to English visitors. Close to the mouth of the River Canche, about 20 miles south of Boulogne, Le Touquet received the secondary name of Paris-Plage when sea-bathing as a health-giving recreation first came into vogue. It is a place endowed with fine natural attractions, and the round of organised pleasures such as theatrical and operatic performances by the best Parisian companies, concerts, dances, etc., is calculated to dispel *ennui* however chronic. Behind the Plage is a magnificent pine forest in the midst of which stands the "Casino de la Forêt," surrounded by beautiful laid-out grounds. Near the sea is the "Casino de la Plage," and stretching across the woods is one of the finest golf courses on the Continent.

Other resorts south of Boulogne are Berck-Plage, Mers and Le Tréport, each with a casino, theatre, etc., and St. Cécile, St. Gabriel, Merlimont, Quend-Plage, Le Crotoy, Brighton-Plage and Cayeux, quiet, decorous resorts where there is no casino. There are numerous other small and undeveloped resorts and fishing villages dotted along the coast.

On the coast east of Calais is Malo-les-Bains, a flourishing place with the inevitable casino, much patronised by Parisians, also Bray-Dunes, St. Pol-sur-Mer and Loon Plage all charming holiday towns. Calais has especial interests for the British, and Dunkirk, a fortified town well repays a visit.

With such delightful places on the French coast so accessible, it is not surprising that the fascination of a holiday abroad is drawing an increasing number of Britons to the Picardy coast each year when holiday time comes round. The resorts are reached very easily from London, the main line of the Northern of France Railway from Calais skirting the coast as far as the River Somme. The time occupied on the journey from

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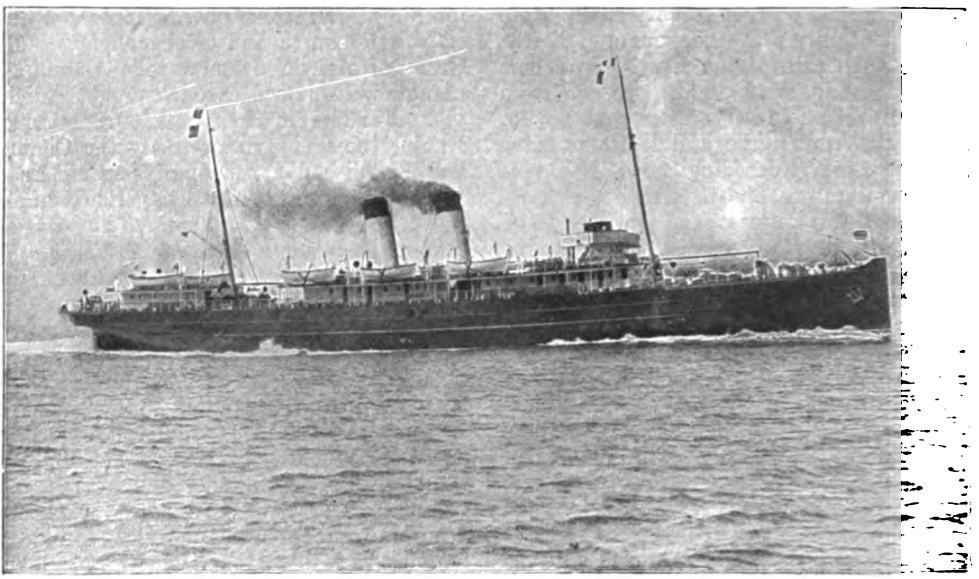

TURBINE STEAMER ENGAGED IN THE SOUTH EASTERN AND CHATHAM RAILWAY CONTINENTAL TRAFFIC.

London to the principal Picardy sea-side resorts *viâ* Folkestone and Dover is approximately as under :—

Calais	3 hours 20 minutes	*Viâ* Dover
Dunkirk	5 ,, 45 ,,	
Malo-les-Bains ..	Electric trams every 5 minutes from Dunkirk	
Loon-Plage	5 hours 30 minutes	
Boulogne	3 hours 25 minutes	*Viâ* Folkestone
†Wimereux	4 ,, 0 ,,	
Hardelot	Tram from Boulogne	
Dannes Camiers for St. Cécile	5 hours 0 minutes	
‡Le Touquet-Paris-Plage	5 ,, 30 ,,	
§Berck-sur-Mer ..	5 ,, 37 ,,	
Le Tréport	7 ,, 10 ,,	
Mers-les-Bains ..	Tram from Le Tréport	

† Also by tram from Boulogne.
‡ Tram from Etaples.
§ Tram from Rang-du-Fliers Verton.

The South Eastern and Chatham Railway issues cheap return tickets valid for varying periods to many of the Picardy holiday resorts, and special rates are in operation for the carriage of cycles and motor cars to Boulogne and Calais.

The sea passages between England and the Continent by the Kent ports services are represented by the following figures :—

Dover to Calais ..	22 miles ..	1 hour.
Folkestone to Boulogne ..	26½ ,, ..	1 ,, 15 mins.
Dover to Ostend ..	57 ,, ..	3 hrs. 20 mins.
Folkestone to Flushing ..	92 ,, ..	5 ,, 10 ,,
Queenboro' Pier to Flushing ..	112 ,, ..	6 ,, 50 ,,

Continental passengers will be interested in the system of "through" carriage working in vogue on the Continent. The familiar arrangement of inter-railway "through" carriage working on British lines pales into insignificance beside the ramifications of the "through" carriages on the Continent, where through arrangements are not restricted to inter-railway working, but are of international dimensions, running through from important towns in one country to foreign towns across conterminous frontiers. From the ports served by the South Eastern and Chatham Company's services, international through carriages are available as follows :—

From Calais to Milan, Interlaken, Geneva, Ventimiglia, Turin, Lucerne, Bale, Berne Coire, Cologne, Liége and Brussels. From Boulogne to Milan, Lausanne, Bale, Interlaken and Brussels. From Ostend to Genoa, Lucerne, Bale, Coire, Ulm, Berlin, Cologne, Carlsbad and Vienna. From Flushing to Berlin, Essen, Leipsic, Stendal, Hamburg, Oberhausen, Cologne, Wiesbaden, Mainz, Goch, Hagen, Strasburg, Heidelberg, Munich and Nürnberg.

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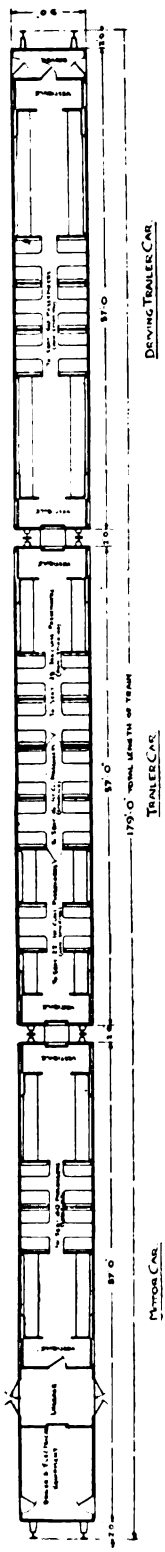

DIAGRAM OF SEATING ARRANGEMENT IN ELECTRIC TRAINS FOR WILLESDEN JUNCTION—EARL'S COURT SERVICE, LONDON AND NORTH WESTERN RAILWAY.

Electric Traction on the London & North Western Railway.

REFERENCE has already been made to the comprehensive electrification works in hand by the London and North Western, North London and London Electric Railways. It is hoped that by the end of the year conditions will be ready for starting electric working on a more or less extensive scale; but meanwhile a start has been made, commencing on May 1st, by inaugurating electric traction between Willesden Junction and Earl's Court.

Conductor rails have been laid through the West London section from Willesden Junction to Addison Road, and thence over the West London Extension and the connecting line to the Metropolitan District Railway to enable trains to work through to Earl's Court. For the time being the electric service merely replaces the steam trains hitherto used, and pending the completion of the London and North Western power station at Stonebridge Park, current is obtained from the Great Western and District Railway Companies' electric sub-stations. For trial purposes and for inaugurating the service, pending the delivery of vehicles on order, District coaches were employed.

The electrical equipment is, generally, of the usual character, no special system of working being possible, as connection has to be made with existing lines operated by direct current at moderate voltage, distributed by positive and negative conductor rails, the former laid outside the track rails and the latter between. The line voltage will be about 600.

The rails are supported on porcelain insulators, attached to the sleepers by malleable iron clips, special anchor insulators being provided at intervals to prevent creeping of the rails. Each rail joint is bonded by four copper bonds of the flexible strip type. The trailing ramps are of cast iron, and the leading ramps on the through lines are of forged steel, and in some cases, as on sidings, of special cast steel. The jumper cables for connecting the several sections of the rails together at cross-overs, etc., are laid solid in bitumenised fibre troughs, and fitted with Mr. Cortez-Leigh's patent sealing terminal, designed to form an effective seal to the insulation of the cable, and, at the same time, to prevent damage to the cables due to mechanical shocks and vibration.

For working traffic on this section, four three-coach trains —motor coach, trailer, and control trailer— are being provided by the Metropolitan Carriage, Wagon and Finance Co. These vehicles will be supplied with end doors and through communication. A diagram showing the seating arrangements is given. The electrical control switch gear is placed in a

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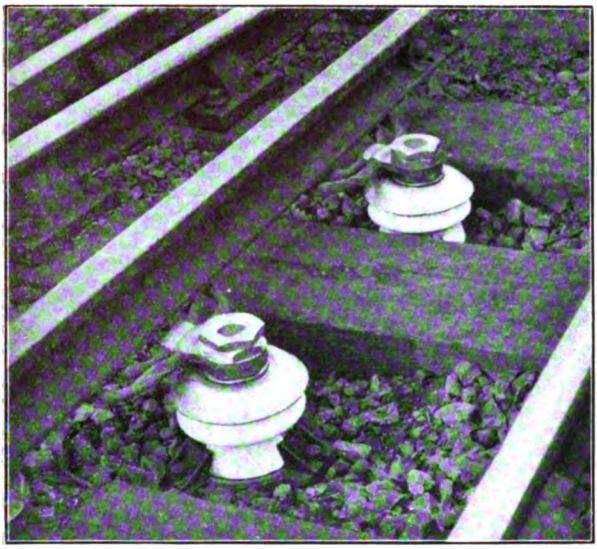


MR. F. A. CORTEZ-LEIGH'S SEALING TERMINAL.

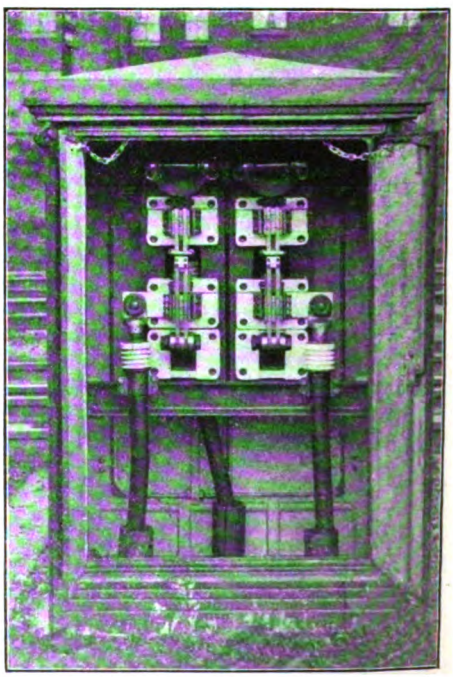
steel compartment at the front end of the motor coach, all parts being readily accessible. The motor cars will have four motors of 250 h.p. each, carried on bogie trucks of specially strong design. The control equipment will be of the multiple unit system with automatic features, including a dead-man's handle. Automatic quick-acting air brakes and the usual hand brakes will be provided for emergency use.

Two of the trains are to be fitted with air compressors of the Westinghouse Co's make, and the other two with Knorr Brake Co's rotary slide valve compressers.

Reference may also be made to progress on other sections. Connection is expected to be completed with the London Electric Railway before the year is out, and thereafter developments will move rapidly. The power house at Stonebridge Park is nearly ready for the machinery, which will include five Westinghouse turbines, driving three-phase alternators, generating current at 11,000 volts, 25 cycles. The various auxiliaries will be driven by alternating current motors, supplied either from the main generators through step-down transformers, or from a low-tension turbo-generator set, used also for lighting, etc. The air pumps for the surface condensers will be driven by steam turbines, and the circulating water pumps by electric motors.

In the boiler-house there will be twenty water-tube boilers, with drop-link automatic stokers, superheaters, and economisers, the boilers being arranged in two rows with a separate chimney stack for each row; each stack will be 14 ft. internal diameter, and 240 ft. in height. Coal and ash handling plant will also be supplied, and will include two tray conveyors for bringing the coal from a large coal storage ground at the end of the power-house site, and two bucket conveyors for elevating coal to the top of the boiler-house and conveying it to the bunkers. A pneumatic system is being adopted for dealing with ashes and soot. Coal supplied to the boilers will be automatically weighed.

The power-house site is of sufficient area to allow of the plant capacity being more than duplicated, and the coal will accommodate a supply of some 20,000 tons of coal, all of which can be handled mechanically. In addition, a considerable extra quantity can be stored in the immediate vicinity should occasion arise. In view of the fact that coal will come from collieries situated on the London and North Western Railway system, and within reasonable distance of London, one of the most important factors in the



FEEDER AND SECTIONALISING SWITCH PILLAR.

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generation of electricity in large quantities will to a great extent be under the Company's own control. Sufficient for a day's working will be delivered into the bunkers every day to replace the amount burnt.

The scheme will involve eleven sub-stations—at Bushey, Headstone Lane, Kenton, Willesden Junction, Queen's Park, West End Lane, Chalk Farm, Dalston, Broad Street, South Acton, and one at the power-house. In each sub-station there will be three six-phase rotary convertors, nine single-phase static transformers, a large storage battery, and an automatic reversible booster. The converting units are to be 750 kw. and 1,000 kw., with a large overload capacity, the machines being of self-synchronising type.

In the case of trains to be used on the main electric system, the first consignment of motor cars are being built by the Metropolitan Railway Carriage, Wagon and Finance Co., and the trailers at the London and North Western Company's works at Wolverton.

Railway Literature.

THE RAILWAYS OF THE WORLD. By Ernest Protheroe. (George Routledge & Sons, Ltd. or from the Offices of the RAILWAY MAGAZINE, 30, Fetter Lane, London, E.C. Price 7s. 6d. net. By post 8s. 0d.). For several years past books dealing with railways and locomotives have been in considerable favour, quite a number having been published, some catering for the younger generation only, others for a more advanced stage, but most of them appealing to the general reader as distinct from the professional railwayman. In the volume now under review Mr. Protheroe has gone a stage further, in that he has collected a great deal of information, and covered considerable ground which, while perhaps in large measure known to readers of the RAILWAY MAGAZINE, is actually far more comprehensive than any previous compilation produced at a substantially corresponding price. No fewer than 734 closely printed pages are given, with a comprehensive index. 16 coloured plates and 419 illustrations; than which one can hardly expect for 7s. 6d., included in a well-bound and neatly produced volume. Acknowledgement is made in the preface of information gleaned from the *Railway Year Book*. Of the 32 chapters, the first ten deal with various general phases of railway activity; then follow 14 devoted to specific home railways, the 25th chapter covering railway ships and docks. Remaining chapters review the railways of Europe, Asia, Africa, North America, South America, and Australia and New Zealand, with a final one on electric railways. Without reviewing the volume in detail, Mr. Protheroe appears to have done his work well, with reasonable accuracy, and there are few phases of railway working which have escaped his attention.

MODERN RAILWAY WORKING. [Gresham Publishing Co., 34, Southampton Street, Strand.] The eighth and concluding volume of this valuable work is now published. Its scope is comprehensive. The Railway Economic section is completed by the Editor's [Mr. John Macaulay, late General Manager, Alexandra (Newport and South Wales) Docks and Railway] contribution on "The Economics of Dock Administration"; an article by Mr. A. D. Lomas, Assistant Land and Rating Surveyor, Lancashire and Yorkshire Railway, on "Railway Rating and Valuation"; a series of contributions dealing with Indian, Foreign and Colonial Railways, based on special researches made by Mr. Cyril Hall, the assistant editor, and including valuable statistical information directly drawn from the highest official sources; and an appendix on "The Care of the Locomotive." Instructive articles in the Indian, Foreign and Colonial section are contributed by Mr. S. C. Williams (India), Mr. Alfred Harington (South Africa), Mr. E. R. M'Dermott, Editor of the *Railway News* (United States and Canada), Mr. S. R. Raffety (Australasia), Mr. W. Parker, Manager of the *Railway Magazine* (Belgium), Mr. E. J. Miller (Switzerland), an official of the French Railways (France), and Dr. J. W. Peters (Germany). The work is issued in eight volumes, bound in cloth, price 7s. 6d. net each, and can be had on exceedingly advantageous terms.

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A Railway Metamorphosis.

THE BERE ALSTON AND EAST CORNWALL LINE.

PERHAPS the most curious case of British railway transformation is provided by the Plymouth, Devonport and South Western Junction Railway in its Bere Alston and East Cornwall line.

Originally a narrow gauge mineral railway it was bought by its present owners and worked as such for several years, with the ultimate object of connecting it with their main line at Bere Alston, which is operated as part of the London and South Western Railway system.

Six years ago the Plymouth and Devonport Company converted the Bere Alston and East Cornwall line into a standard gauge railway, equipped it in modern fashion, built a magnificent viaduct over the river Tamar and constructed a new line from Calstock to Bere Alston, thus providing a new passenger route through the most beautiful and picturesque scenery in Cornwall.

A map of the system is shown on page 515. The line from Lydford to Devonport leased to and worked by the London and South Western Railway is 22 miles 11 chains in length. The light railway from Bere Alston to Callington measures 9 miles 54 chains and it will be seen that between Bere Alston Junction and Callington there are four intervening stations. Recently, however, there has been erected a halt at "Sevenstones for Phœnix" on the slopes of Kit Hill which stands 1,000 ft. above sea level, and overlooks a grand panorama of country stretching from the Caradon Hills on one side of Brentor and Dartmoor on the other, and situate on the main road to Kit Hill, about one mile to the summit.

To render the transformation of the railway from a mere mineral line into a passenger and goods carrying concern a commercial success, the policy of affording every possible facility to tourists and holiday makers, as well as local residents and traders, has been adopted with no small measure of success.

Certainly the Company's "Official Time Table and Excursion Programme" is an attractive little book, not by reason of elaborate illustration, but because of the tempting array of special travel arrangements it presents. Tourists, excursionists, Sunday schools, Wesley Guilds, bands of hope, employé's outings, picnic and pleasure parties are admirably met in all their wants. A new issue of the book giving the train service June 8th to September 30th, 1914, inclusive, can be obtained from Mr. S. G. Hartnell, General Manager, Callington.

The service referred to consists of five trains each way between Callington and Bere Alston Junction on ordinary week days and six trains on Saturdays. On Thursday and Saturday mornings there are coach services both ways between Congdon Shop (for North Hill) and Callington station.

Owing to the operation of the Railway Companies Accounts and Returns Act, 1911, it is not possible to set forth separately the earnings and traffic of the light railway as was formerly the case, but the receipts from the main line and the light railway in 1913 showed a satisfactory increase, and for the second half of the year a dividend of 3½ per cent. per annum was paid as compared with the distribution of 3 per cent. for the corresponding period of the previous year. An interim dividend at 1¼ per annum was paid on the ordinary stock for the first half of 1913.

Passenger traffic is divided into two classes only, first and third, and as in the case of the larger lines, the democratic class predominates. During the year 1913 there were carried 330 of the higher and 112,309 of the lower class passengers. No workmen's tickets were issued. The passengers originating on the company's own system were 191 in the 1st class and 79,635 in the 3rd class. No first class annual season tickets were in use, but twelve, of which no less than eleven originated on the system, were in operation.

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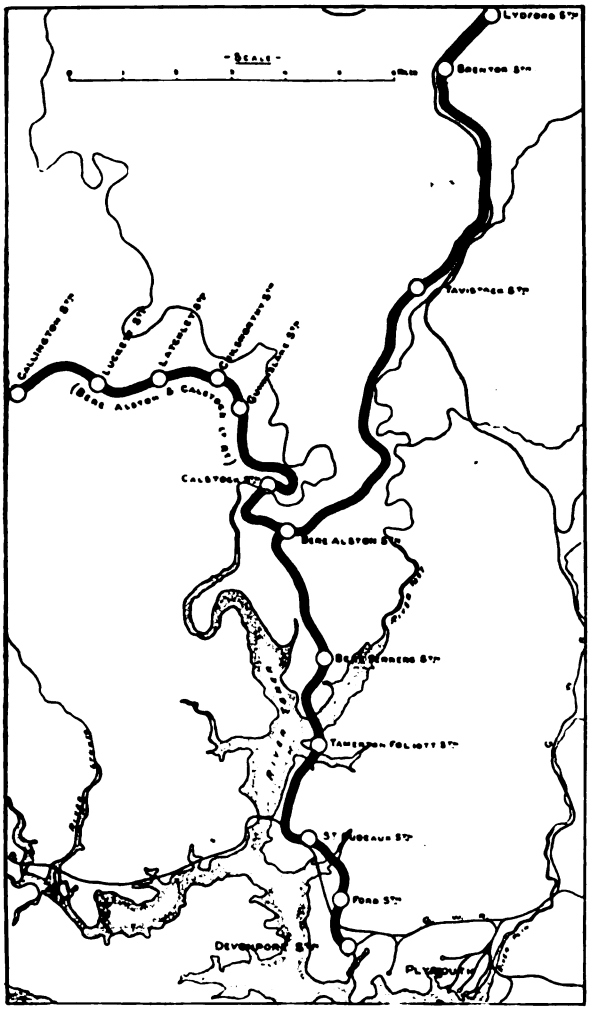

PLYMOUTH, DEVONPORT AND SOUTH WESTERN JUNCTION RAILWAY.

Showing Bere Alston and Calstock Light Railway and connections with the main line, worked as part of the London and South Western System.

As the attractions the line has to offer visitors to Plymouth, Tavistock and other large places in the vicinity become better known, there is little doubt the traffic will grow at an increasing ratio.

Three tank engines of the 0-6-2 type and one 0-6-0 serve this well-managed little railway, and the coaching stock consists of eight vehicles providing seating for 230 passengers.

The mines and quarries in the districts served provide a substantial traffic to the line, and goods traffic is certainly developing. During the year 1913, the tonnage originating on the company's system, including 400 tons of arsenic, was merchandise 1,833, coal, coke and patent fuel 60, and other minerals 5,144, making a total of 7,037 tons. The total tonnage from all sources and in all classes was 29,173 tons The company during the same year carried 2,503 head of live stock, and the number originating on the system was 2,411.

H.R.H. the Prince of Wales has recently opened a stud farm close to Callington station and in the near future extensive traffic may be expected.

Calstock Quay and Danescombe Quay, the one 399 and the other 54 yards in length, are owned by the company, while the rolling stock for goods traffic consists of 50 open wagons, 1 covered wagon, and 2 brake vans.

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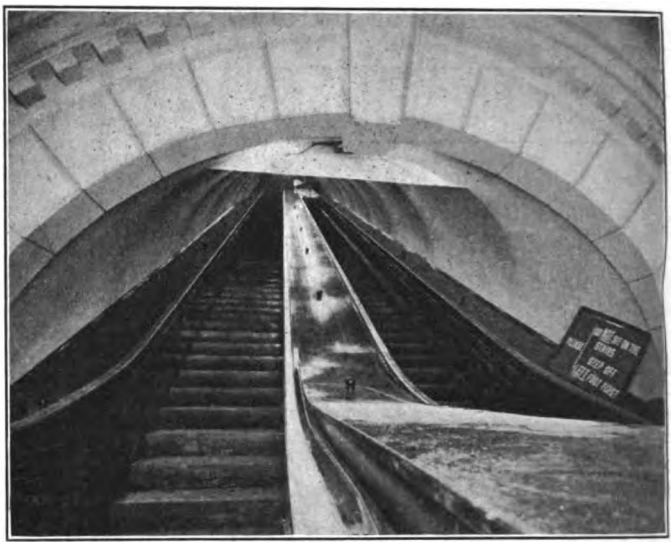
Improvements at Oxford Circus Underground Station.

THE LARGEST ESCALATOR IN THE WORLD.



ESCALATORS AT OXFORD CIRCUS STATION: LONDON ELECTRIC RAILWAY.

THE enterprise of the Underground Company and its policy of continuous improvement have been very much in evidence during the past six months, particularly in relation to the Bakerloo Railway, the oldest of the three lines comprising the London Electric system. Another notable improvement recently carried out has been the installation of escalators, or moving stairways, at the Oxford Circus Station of the Bakerloo Railway, these being put into public service for the first time on Saturday, May 9th. The escalators in question are the largest in the world, and their construction has involved engineering difficulties of an arduous nature.

Work at Oxford Circus was commenced in November, 1912. The preliminary operations consisting in driving new tunnels 11 ft. 8½ in. in diameter, from the south bound platform to the lift passages, to take the place of those which would be blocked by the lower end of the escalator compartment. This task having been completed, preparations were made for boring the escalator tunnel. In the meantime 30 in. and 24 in. water mains beneath Oxford Street and directly in the path of the escalators had been diverted. The range of lavatories and other offices in the basement below the original booking hall on the corner of Argyle Street were removed, and the basement enlarged to form a new booking hall and circulating area, and the machinery chamber of the escalators. Next the column supporting the station superstructure were taken out and replaced by massive steel girders, the serious nature of the operations necessitating them being carried out piecemeal, extreme care having to be exercised in the shoring up and underpinning of the station buildings. The construction of the escalator tunnel then began, and the first ring of the lining was put into place on June 6th, 1913. Water was encountered when boring operations had reached a depth of 33 ft. below the level of the street, and to overcome this difficulty a tunnel, 5 ft. 6in. in diameter was driven along the water line, completely encircling the path of the escalator tunnel this work, occupying eight days. The keys being withdrawn, interlocking steel piling was driven through the bottom of the tunnel into the clay. Thus only the water within the dam had to be dealt with, this being pumped therefrom into a pit in an adjacent part of the works, whence the water percolated through again to its own level, none actually being removed from the site. The 5 ft 6 in. tunnel was then filled in with solid concrete, and the driving of the escalator tunnel resumed, and completed without further obstacles being encountered. Connection with the subways providing the means of access and exit to and from the platforms was then effected. The boring operations were carried out entirely by hand, and during the course of construction the engineers had to get the whole of their plant and tackle through

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an aperture in the roadway of Argyle Street only 5 ft. 6 in. square. The escalator tunnel has a diameter of 16 ft. 4 in. and a length of 110 ft. between the machinery chamber at the top and the lower landing compartment at the bottom, which is 21 ft 2¼ in. in diameter.

The escalators consist of two stairways, one for descent, the other for ascent, and like those at Earl's Court, they work alongside each other. Each stairway is formed of an endless chain, to which are attached 250 oak steps, 4 ft. in width, impregnated and fire-proofed. When the stairways are in motion 82 of the steps fall into position automatically on the inclined planes, which are 121 ft. long, with a vertical rise of 54 ft. practically double the size of the escalators connecting the Hampstead and District Railways at Charing Cross. Each stairway can accommodate 300 people at one time with ease, and, moving at a speed of ninety feet per minute, the two combined are capable of transporting about 27,000 passengers in the course of an hour. The escalator which normally descends is reversible, this arrangement providing against the contingency of a stoppage to the ascending stairway, which in such case would be used as an ordinary stationary staircase by which passengers would descend, the reversible escalator being adapted for the ascent. Motive power is supplied by four 62 h.p. direct current, shunt wound, interpole motors of the Otis type, of 560/600 volts, working at 473 revolutions per minute. Two of these are coupled together in the machinery chambers, which are situated beneath the upper landings of the escalators. One motor in each set operates a stairway, the other being a spare for emergency use, and in the event of an electrical break-down to the working motor, the spare would be brought into service at once by a simple switching arrangement. The transmissions by means of spur gearing to the main driving sprocket at the top of the escalator, and also through a shaft and bevel gear to an auxiliary driving sprocket near the lower end of the stairway, the great length of the latter necessitating this supplementary drive. Should a failure of current occur an automatic braking attachment is at once brought into action, and a reversal of the ascending escalator prevented. Either stairway can be stopped instantaneously by the attendants stationed on the landings simply by pressing a switch. Members of the public who prefer the lift as a medium of transit between the trains and the street —and there are now very few people with this peculiarity—will be able to use the lifts of the Central London Railway, which has subway connection with the Bakerloo line.

The new circulating area and booking hall is reached from Oxford Street by a short flight of steps leading down to the entrance of the escalator compartment, and, adjoining, a new passage which connects the existing spiral staircase to the lower levels. The three electric lifts which were formerly in use at the station will be removed, the shaft floored over, and part of the space thus acquired added to the booking hall, the portion under Argyle Street being used for the erection of new lavatories and cloak rooms. The total cost of the improvements and alterations will have amounted to over £53,000—a large expenditure, but one which reflects not only the wonderful development of traffic at Oxford Circus which rendered it necessary, but also the progressive policy of the Underground Company in effecting these and similar improvements forthwith as occasions arise.

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The Freshwater, Yarmouth and Newport Railway.

By H. S. G. EASTMAN.

THE Isle of Wight has in recent years become an exceedingly popular holiday resort during both the summer and winter months, and a few words concerning one of its railways, although a small one, may not be out of place. Known as the Freshwater, Yarmouth and Newport Railway, this line was opened about 24 years ago. As stated in the RAILWAY MAGAZINE in August last, the line has, since 1889, been worked by the Isle of Wight Central Company, but it is now conducted as a separate concern, Mr. W. H. Hunstone, formerly of the Great Central Railway, being the Manager, with offices at Newport. Under the new auspices the train services have been much improved and fares reduced. For instance, the second class fare, formerly 2d. per mile, has been reduced to 1d., while on certain days cheap tickets are issued by certain trains from Freshwater and Yarmouth to Carisbrooke and Newport, at 1s. return, second class, also similar excursions in the reverse direction. The time table drawn up for the winter of 1913–14, provides on ordinary week-days six trains from Newport to Freshwater and the same number from Freshwater to Newport. On Saturdays there are eight trains each way, the extra ones from Freshwater leaving at 4.25 p.m. and 9.40p.m., and from Newport at 3.20 p.m. and 10.20 p.m., a train leaving Newport on Saturdays at 5.16 p.m. instead of 4.15 p.m. On Sundays there are four trains in each direction.

Of the two locomotives employed, one is a 0–6–0 London and South Western Railway tank engine, the other a 0–6–0 Freshwater, Yarmouth and Newport Railway saddle tank engine. The carriages have four wheels, and there are four or five compartments in each carriage. There are two classes, first and second, the latter being equivalent to the third class on the mainland. The goods vehicles include box wagons, four wheeled trucks, and cattle trucks, the latter having been converted from goods trucks. There are six stations in all, in four of which the public are keenly interested. Farringford Estate, at Freshwater, was for many years the home of Alfred, Lord Tennyson, the celebrated poet, who produced several of his chief works there. On High Down, near Freshwater, there is a granite cross 40 ft. high, erected to his memory. Not far from Farringford is a fine house with a beautiful garden, a favourite residence of Watts, the famous artist. In earlier days George Morland visited Freshwater, and it is known that he painted several pictures there.

The two largest hotels are the Freshwater Bay Hotel and the Albion. Both are in the Bay, quite close to the sea. The latter stands on the site of the old Mermaid Inn, which was in existence over 110 years ago. Freshwater Bay is an ideal seaside resort. Yarmouth, the headquarters of the Solent Yacht Club, is one of the most important seaports in the Island. Here the London and South Western Railway steamers land passengers from Lymington. Just off the shore is an excellent anchorage for yachts, and the adjacent tidal inlet affords safe and convenient winter quarters for the small vessels. H.M.S. *Gladiator* sank close to Yarmouth, after the disastrous collision with the American liner *St. Paul* in the spring of 1908.

Carisbrooke is another place of note on the line because of its famous Castle, which all visitors go to see. In the Castle may be seen the remains of the chamber in which Charles I. was imprisoned, and from which he eventually escaped. Within the Castle precincts is a well nearly 200 ft. deep, the water being still raised by a donkey working a wheel. Newport, the terminus of the line, is the capital of the Isle of Wight. Within the last fifty years so many new houses have been built that the town has quite lost any pretensions it might have had to anything approaching antiquity. In the Parish Church, rebuilt in 1854, is a fine memorial tomb erected by the late Queen Victoria to Princess Elisabeth, the daughter of Charles I.

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PERTINENT PARAGRAPHS

New 2-8-0 Locomotive: Somerset and Dorset Joint Railway.

PARTICULARS have already been given of the new 2–8–0 locomotives, with Schmidt superheaters, built at the Derby Works of the Midland Railway, for use on the Somerset and Dorset Joint Railway; and the first of these forms the subject of our coloured plate this month. They have been designed by Mr. Henry Fowler, Chief Mechanical Engineer, Midland Railway, and the order is for six engines. They are the first eight-coupled engines built at Derby and placed in service, and they are the first of such locomotives to be introduced by a joint railway. Loads 50 per cent. heavier than those previously hauled over the steep grades of the Somerset and Dorset line can now be dealt with, but "banking" is still to be resorted to over the sections where this practice has hitherto been observed.

No. 80 is painted black, with the number painted on the sides of the cab instead of being shown in raised brass figures. As there is no turntable on the Somerset and Dorset line where these engines can be turned, a double cab is provided for protection when running tender first. The tablet changing apparatus used in single line working is fitted on both sides of the tender for the same reason.

The engine weighs in working order 70½ tons, of which 62 tons are on the coupled wheels. The driving wheels are 4 ft. 7½ in. in diameter, with a leading two-wheeled "Bissell" truck, with wheels 3 ft. 3½ in. in diameter. The cylinders are 21 in. diameter, with a stroke of 28 in., the piston valves being actuated by Walschaert valve gear and mechanically lubricated. Working pressure is 190 lb. per sq. in., the total heating surface 1,681 sq. ft., and grate area 28·4 sq. ft. A Schmidt superheater is fitted and a Belpaire firebox is adopted, both being new features on this line. Weight of engine in working order is 70½ tons, tender 45 tons 18 cwt.; wheelbase, engine and tender, 50 ft. 1 in., total length over buffers, 59 ft. 9⅝ in. The leading radial wheels are fitted with brake blocks acting on both sides.

* * *

Great Western Railway Traffic Improvements.

THE Great Western Railway Time Table, applying to the period from May 4th to July 11th, appears in a new and attractive cover. Several interesting alterations are announced. The most important is the new schedule given to the 11.50 a.m. Torquay express. Starting 10 min. later, the main train is booked to run through to Torquay without stop in 3 hrs. 38 min.; a portion is slipped at Taunton at 2.30 p.m., and this is then taken on, still reaching Exeter in 3 hours from London, and serving Newton Abbot and the Kingswear branch, with a connection for stations to Plymouth. The 1.15 p.m. summer express from Penzance to London commenced running on May 4th. A new train leaves Paddington at 11.20 a.m. for Oxford, calling at Reading, connecting at Oxford with the 1 p.m. through express to Leamington, Birmingham, Manchester, and Birkenhead. The 12 noon train from Worcester is accelerated, leaving Oxford at 1.45 p.m. and reaching Paddington at 2.55 p.m. In addition to the seat reservation arrangements applying to the "Cornish Riviera," "Bath Spa," and one or two other trains, seats can now be reserved upon payment of a registration fee of one shilling for each seat on the 12 noon express for Taunton, the Torquay line and Kingsbridge, and the 10.25 a.m. and 3.45 p.m. from Kingswear to Paddington. Diagrams showing the seating accommodation can be seen and seats booked, either on personal application or by post, for down trains at Paddington, and for up trains at the principal stations at which the trains call.

Additional rail motor-car services have been placed on several sections. Between Chepstow, Ross, Monmouth and Gloucester, the usual summer service will commence on June 1st.

A peculiar feature of the time table is that it includes particulars of the 9.30 a.m. Devon and Cornwall special third-class train, introduced last year, though it does not start running until July 24th, after the time table has expired. Presumably this is given as a preliminary announcement.

* * *

Model Railway Speeds.

IN reference to the article on the Sand Hutton Railway, published in the March RAILWAY MAGAZINE, Mr. G. Greenhill writes as follows:—

"According to the law of mechanical similitude, the velocity in the model should be as the square root of the linear scale. We see this realised in the Atlantic steamship, where it goes by the name of Froude's law. So that on a model line of 15 inch gauge, one quarter the linear scale of the full size railway, the corresponding speed should be one-half; and a speed of 30 miles an hour on the model railway is the equivalent of 60 at full size, and not 120 miles an hour. The steam pressure can be reduced to one quarter, say 40 lbs. per sq. in., but the revolutions per minute are doubled, say from 5 to 10 per second, or from 300 to 600 per minute. Mr. Last, late director of the Science Museum at South Kensington, was the first to put in motion his collection of historic models; and if he wished to give the appropriate speed to one of the models, say of a Watt beam engine,

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the revolutions should be such as to make the governor work in the model. But this speed is too quick for the eye to follow the motion of the working parts, so that Mr. Last decided to run the model with revolutions the same as of the full size engine."

In reply, the writer of the article states: "The figures given were not intended to be taken as scientific data, but merely to express the capabilities of the model locomotive in terms that would be more readily understood by those accustomed to the performances of the prototype. The basis of the figures was, of course, the speed of the moving parts, which, to a scale of one-quarter full-size, is four times the speed of the corresponding parts in a full-sized locomotive. Furthermore, the impression gained from a trip on the foot-plate of this diminutive engine at 30 miles per hour is one of a much higher proportionate speed than the correct scientific figure of 60 miles per hour in the case of the ordinary locomotive."

* * *

New Facilities on the North British Railway.

THE Lothian Coast expresses, connecting Glasgow and Edinburgh with North Berwick and other favourite east coast resorts, will be resumed in June, while the Glasgow and Fifeshire Coast express will commence on June 15th, and will run daily, except Saturdays, instead of only at the week-ends as in June last year. In the Western district the summer service on Loch Long will be resumed as from June 1st, and the usual increased train and steamer service to the Clyde resorts will be in operation. On the West Highland line a train will leave Glasgow for Crianlarich at 5.12 p.m., commencing in June, and a new train from Crianlarich to Glasgow at 8.5 a.m.; but the 10.9 a.m. from Glasgow to Fort William and 12.55 p.m. from Fort William to Glasgow will not be run. Commencing in July, a new train will leave Glasgow for Fort William at 11.45 a.m. in place of the 10.9 a.m. and 12.43 p.m. trains from Glasgow. The 3.20 p.m. from Glasgow to Fort William will be continued, and will be the last through train to Fort William. Commencing in May, a new station was opened at Seton Mains Halt, between Prestonpans and Longniddry, for the accommodation in that district.

* * *

Mr. H. W. Firth and Railway Electrification.

A PAPER read recently by Mr. H. W. Firth, before the members of the Institution of Electrical Engineers, is notable in that present conditions are accepted, and suggestions advanced with a view to reconciling them with the advantages and possibilities of electric traction. Great Eastern suburban traffic is essentially of a "peak" character, and most of the junctions are surface, so that increase of train services becomes a formidable factor. His idea is that standard services should be operated electrically, and amplified at busy periods by steam trains on fast schedules, thus to some extent compensating for the superior acceleration of electric trains on station-to-station duties. This avoids the provision of electric power for maximum traffic demands, and keeps the electrical equipment as a fairly steady factor throughout the day. Mr. Firth also considers that services such as those to Southend and Clacton-on-Sea should almost be considered as suburban, and included in the electrification proposals.

* * *

The Royal Visit to Paris.

ON the occasion of the recent visit of the King and Queen to Paris, on the invitation of the President of the French Republic, the train from Victoria consisted of superheater 4–4–0 locomotive No. 30, prepared for the occasion, and six vehicles. The first was a brake saloon accommodating footmen and valets: next came a special saloon, the third vehicle being the Royal saloon. The fourth vehicle was also a saloon, while the fifth was a first-class semi-corridor compartment carriage for servants and minor officials. The train was completed by a brake saloon. The third, fourth, and fifth vehicles only were vestibuled.

After travelling through the streets of Dover to reach the Prince of Wales' Pier, the train came to a stand punctually at 10.20 a.m., and with the usual salutes the Royal passengers and suite went on board the Royal yacht *Alexandra*.

On the Northern Railway of France the train was taken by compound superheater 4–6–2 locomotive No. 3.1157. Eight vehicles were provided. The first and last were first-class corridor carriages, each containing three ordinary first-class compartments, and two *compartiments de luxe*. The second vehicle is known as "Salon Royal Anglais, No. 2." It was built in England, and is the personal property of the King, and is stored at Calais. It is decorated in dark blue, and bears the Royal monogram, and is used for all Royal journeys on the Continent, being sent from Calais to any Continental port where members of the Royal Family may land. The third vehicle was a "Wagon-restaurant" belonging to the International Sleeping Car Co. The fourth vehicle was a combination saloon vehicle, belonging to the French Presidential train, the fifth being a side corridor vehicle, with several *compartiments de luxe*, and the sixth another type of combination saloon, *compartimente de luxe* and compartment vehicle. The seventh vehicle was a first-class side corridor carriage for servants and minor officers.

The train weighed about 300 tons behind the tender. The following are the principal passing times: Calais (Maritime), depart 12.20; Calais (Ville), pass 12.24; Abbeville, pass 1.52; Amiens, pass 2.21; Longueau, arrive 2.26, depart 2.30; St. Just, pass 2.59; Creil, pass 3.18; Chantilly, arrive 3.27, depart 3.35; Pont Marcadet, arrive 4.4, depart 4.16; Avenue du Bois de Boulogne, arrive 4.35. The stop at Longueau was for water, that at Chantilly to enable the Government delegation to join the train. At Pont Marcadet the Ceinture Railway was joined, thus necessitating the reversing of the train and the attachment of a fresh engine, which was decorated with English and French flags. On the return journey their Majesties were received at Dover by Mr. Cosmo Bonsor and officials of the South Eastern and Chatham Railways. Mr. A. Sire, representative of the Northern Railway of France in Great Britain, was invited to join, and was introduced to His Majesty, who conferred on him the decoration of M.V.O.

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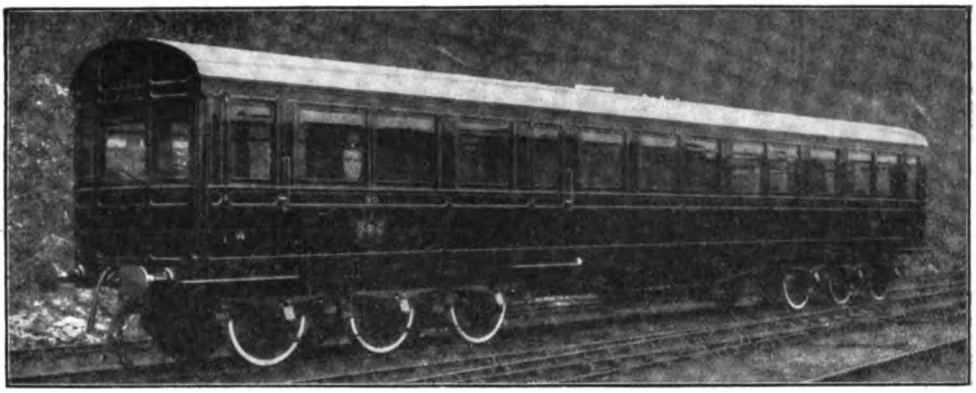

NEW DIRECTORS' SALOON: LONDON, BRIGHTON AND SOUTH COAST RAILWAY.
Designed by Mr. A. H. Panter, Carriage and Wagon Superintendent.

New Directors' Saloon: London, Brighton and South Coast Railway.

FOR use by the Directors a new saloon has been built at the Lancing Carriage Works of the London, Brighton and South Coast Railway, to the designs of Mr. A. H. Panter, Carriage and Wagon Superintendent, from whom we have received the particulars of this interesting vehicle, illustrated on this and the next page. The saloon is 60 ft. long, and is divided into two main compartments, 26 ft. by 7 ft. 8 in., and 12 ft. by 7 ft. 8 in. respectively. These are connected by a corridor, which also gives access to the lavatory and butler's pantry. The observation ends of the saloon are made in bay-window form, giving a complete outlook of the track when running. The inside finish is of mahogany and satin wood, with a perfectly plain white roof, relieved only in delicate "Adams'" design. The small compartment is fitted with lounge chairs, and the large compartment with small dining-room-type chairs, upholstered in green morocco hide. Two tables are provided in the latter compartment, which can be used for dining or for Board Room purposes. The electric lighting is "Stone's" system, and the fittings are oxidised silver-plated. The carriage is mounted on a steel underframe, with six-wheel bogies, 11 ft. 6 in. wheelbase, and the centres are 40 ft.

* * *

Enginemen on the Footplate.

A STOURBRIDGE reader directs attention to the varying practices of different railways of placing drivers on the left hand or right hand side of the footplate. On the Midland, the driver is placed to the right, suggesting a difficulty as regards observing platform and other signals, whereas when the opposite location is adopted, as on the London and North Western and Lancashire and Yorkshire Railways, the fireman may have to adapt himself to left-hand firing. There is, as far as we can gather from personal observation, relatively little in this matter, and it is quite possible that in many cases the respective practices have arisen in consequence of early methods and in course of development. On small engines the driver may incommode the fireman to some extent; and in all cases a right-hand driver is less favourably situated to observe what is going on at a station platform. But in the latter event, the fireman is usually able to look out for the guard's "right-away," or other instructions, while the driver himself can do more in this way than is generally realised. While running there is little to choose between the two policies. Signals to the left of the line are, as often as not, best observed at a distance from the right of the engine; while right hand signals may similarly be looked for from the left. In either case the boiler, dome and chimney offer the same difficulties or conveniences of observation. In regard to firing, both right-hand and left-hand drivers are usually able to stand in positions which do not interfere with the fireman's movements at all; and in any event, whatever the practice adopted, the men are used to it and adapt themselves accordingly.

* * *

The Uganda Railway.

As a result of the short article on this remarkable railway, published in the February RAILWAY MAGAZINE, a reader has asked for details of the train services and railway arrangements, and by the courtesy of the Agent in London, we are able to refer further thereto. From Mombasa the line rises almost continuously, except for brief falls at Tsavo, Kiboko, and Athi River to the summit just beyond Uplands (360 miles, 7,900 ft. above sea level). It then falls steeply to Kijabe, and is generally descending to Nakuru (445 miles), then rising at severe gradients to Mau (490 miles, 8,200 ft. above sea level), thence falling virtually all the way to the pier on Lake Victoria Nyanza (584 miles, 3,726 ft. above the sea) at Kisumu. Thence steamers ply along the Kavirondo Gulf and the famous lake to Jinja to connect with the Busoga Railway thence to Namasagali. The only branch is that from Magadi Junction to Lake Magadi, known as the Magadi Railway.

From Mombasa there are local trains at 6.40 (to Miritini, 10 miles), at 11.10 (to Mazeras, 16 miles) and 15.20 (to Mazeras), with a midday through train which does not call at Kwa Jomvu (8 miles). It will be noted that the 24-hour system is adopted. The midday train is the only one as far as Nairobi. Thence after an interval for lunch, the journey is resumed at

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noon on Tuesdays, Thursdays, and Saturdays only to Kisumu. On Mondays there is another train at 14.30, and on Saturdays an extra at 13.30 through to Kisumu. On Wednesdays and Sundays a train at 8.0 runs as far as Nakuru, while on Fridays there is a similar train at 9.0, also to Nakuru. On Wednesdays there is a train from Nakuru at 10.36 to Kisumu. Return services are arranged on a corresponding basis.

The through trains run as follows:—

		TRAIN.	
Mombasa	dep.	Mon. and Fri.	Midday
Kisumu	arr.	Wed. and Sun.	6.50 a.m.
		STEAMER.	
Kisumu	dep.	Wed. and Sun.	7.30 a.m.
Jinja	arr.	Thurs.	9.0 a.m.
,,	,,	Tues.	4.0 p.m.
		TRAIN.	
Jinja		Thurs.	10.30 a.m.
Namasagali		,,	3.0 p.m.

The return journey is made from Namasagali on Tuesdays at 12.30, leaving Jinja on Wednesdays at 3.0 and Thursdays at 9 p.m. Mombasa being reached at 10.30 on Saturdays and Tuesdays. From Namasagali steamers leave on Thursdays or alternate Thursdays for various ports, while from Kisumu the steamers follow a longer route in connection with the Friday service from Mombasa than they do in conjunction with the Monday service.

* * *

Traffic Arrangements.

Four classes are run: first, second, intermediate and third. On the steamers there are first, second and deck rates. Six steamers are used on Lake Victoria, and are triple expansion, twinscrew vessels, the two largest, the *Usoga* and *Rusinga*, being of 1,150 tons displacement.

Except for the special through trains, stoppages are made at various halts along the route. From Nairobi there is a tramway to Thika, 32 miles, with one service each way daily. Special trains are run between Kilindini Pier and Mombasa when mail steamers are in the harbour.

Some of the traffic arrangements in force on this railway appear peculiar and interesting to English readers. First-class compartments provide sleeping accommodation, but passengers are required to furnish their own blankets, pillows, etc. A limited number of saloon carriages with kitchens are available on application. The minimum charge for a small saloon is, four first and three third-class fares: for a large saloon, 1s. 8d. per mile. If more than four first-class and three third-class passengers travel in these saloons, fares for the number of persons over and above must be paid in addition.

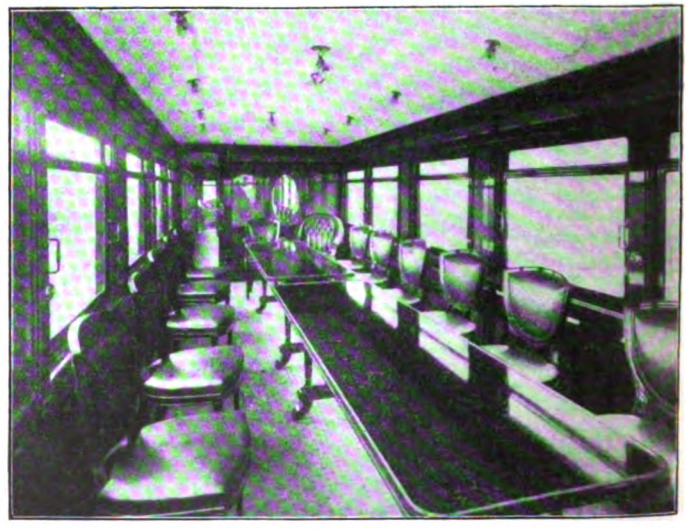
When twenty or more adult persons notify their intention to travel as far as Nairobi from the same steamer a special train may, subject to the exigencies of traffic, be arranged. For the comfort and convenience of first and second-class passengers, Dak Bungalows have been provided at Voi, Makindu, Lumbwa and Kisumu, the free use of which may be had for 24 hours, but an additional charge of 2s. 8d. is made for each subsequent day or part thereof. Passengers availing themselves of the retiring rooms are required to furnish their own servants and provide their own bedding. Refreshments are provided at all important stations. Luncheon and dinner baskets can be obtained at the principal refreshment rooms.

For passengers travelling past Mombasa or Kilindini on steamers calling at these ports special facilities are offered for a trip up country by the Uganda Railway. If the length of the ship's stay in port admits, the journey can be extended as far as Lake Naivasha. Passengers can then obtain a sight of the Great Rift Valley, one of the most extensive views obtainable in Africa. Apart from this, before reaching Nairobi, the train passes through a most unique zoological reserve, and large herds of game are seen from the carriage windows.

* * *

Is our Continental Traffic Efficiently Conducted?

ARISING out of a letter to *The Times* detailing the hardships of an "English Vicar's" third-class journey from London to Brussels, an interesting correspondence has arisen, largely based, however, upon a complete misunderstanding of the real facts of the case. The original complaint was that whereas first and second-class passengers are carried by express train from Charing Cross at 9 a.m., third-class passengers are compelled to leave London at 7 a.m. and change at Ashford. Further, it was stated that no arrangements were made to convey luggage from Dover Harbour station to the boat, the advertised three-hours' passage occupied 4 hours and 12 min., and at Ostend third-class passengers were hurried into a train,



INTERIOR OF NEW DIRECTORS' SALOON: LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

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while first and second-class passengers had time at Ostend for refreshments, left by a later train, and arrived in Brussels earlier.

As regards the general facts, the explanation given by the railway company meets the case. It is pointed out that of the three London-Brussels services, the 9 a.m. from London is a mail service and is intended solely for first and second-class passengers, and is so described in all time tables. No arrangements are made for conveyance of third-class passengers, who must, therefore, if they wish to use the morning sea passage, get to Dover by ordinary train. It would scarcely be reasonable to divert this ordinary train to Dover Pier because there happened to be an Ostend passenger in it, to the inconvenience of the other passengers. As boat-trains run direct to Dover Pier, there are also no arrangements for the conveyance of passengers' luggage between the Harbour station and the boats. The boat trains by special arrangement run on to the Admiralty Pier, the railway company having to pay for this privilege.

It was also stated that first, second, and third-class passengers by this service leave Ostend by the same train. There is, however, a Nord express, consisting of sleeping, saloon and restaurant cars, which leaves Ostend 10 minutes after and arrives in Brussels 8 minutes earlier than the ordinary train. With regard to the slow passage of the *Rapide* (the Ostend boat), it was stated that the average time taken was about 3½ hours. It was not possible, without inquiry, to say why on this particular day the voyage occupied 4 hours and 12 min.

* * *

The Real Facts.

In some respects, however, this explanation hardly goes far enough, and it does not meet the kindred grievance that ordinary passengers between London and Dover are required to pay special fares if they desire to travel by the boat trains. What is not realised is that these trains are Continental trains, run for Continental traffic only, and that the facilities at present provided have been created expressly to meet the requirements of this traffic, while heavy charges are entailed for use of the harbours concerned. In fact, there is no accommodation for ordinary travellers or for Continental traffic other than that advertised for the simple reason that they could not take anything beyond their specified traffic. Indeed, it is almost a daily occurrence for one or more of the South Eastern and Chatham Continental trains to be duplicated, and triplication is by no means unusual, and in almost every instance the loads worked by the engine represent the maximum duties given to them. The demand for reserved seats in the ordinary carriages, as well as the Pullman cars, is a heavy factor; but passengers have little to complain on this score except where the demand exceeds the supply, when, naturally, everyone cannot receive the same attention.

But even more important is the fact that although the trains on this side are English, and there is a tendency to estimate them on an English basis, they are in fact, as well as in name, Continental trains; so that third class by them is a concession given in view of facilities arranged on the Continent, and is in no sense an equivalent to English third-class travel. Abroad, ordinary long-distance travel is usually first or second-class, and numerous principal trains are limited to first and second-class passengers, frequently with special fare arrangements to complicate matters. Here we are not used to considering the third class as markedly inferior, nor to "limited" and "special fare" restrictions; but when it is remembered that these trains, though running on an English railway and appearing in the same time table as essentially English trains, are really portions of the chain of communication which extends *viâ* Boulogne, Calais, Ostend, Flushing and other ports all over Europe, the situation becomes at once clear.

In the case of Great Eastern Continental trains from London to Parkeston, the distinction is marked by the fact that there is no second class on the standard services. Therefore one at once understands that second class on the Continental trains is in accordance with Continental methods. On the South Eastern and Chatham, however, three classes are in general use, so that the absence of third-class accommodation appears to be a grievance, and the general public is, naturally it is true, inclined to reckon the first and second class arrangements on the Continental trains on the same basis as the first and second-class arrangements on other trains of the same railway.

Among various suggestions advanced by correspondents, is that the reservation of a seat in the French train should also cover corresponding reservation on this side, or *vice versa*. There are, however, complicating factors. It is obvious that a seat in a French train corresponding to a similar seat in the English train would only be practicable if there were nothing but a Paris service. There may be three or four trains from other parts of Europe run in connection with the same boat; and a struggle between the passenger who had No. 2 seat on the Bale train, No. 2 seat on the Berlin train, No. 2 seat on the Paris train, and No. 2 seat on a train from the South of France, for No. 2 seat in the train on the English side would not be very edifying. The passenger who grumbles takes no account of the fact that it is possible to reserve a seat by wireless while on the passage across.

* * *

"Broad Gauge" in Germany.

A peculiar proposition is advanced by a German engineer who has, however, it is to be presumed, little practical acquaintance with railway working. He argues that railways have "outgrown their clothes," particularly in reference to wagon capacity. He, therefore, suggests that 100-ton cars should be built, and to receive them the 4 ft. 8½ in. gauge "should be changed for a gauge sufficiently broad and well ballasted to stand the impact of such heavy cars. For passenger traffic the normal gauge may suffice a while longer, though even to-day it is worth considering whether city roads, and, above all, express trains, should not have a wider gauge. But big industries must have broad gauge roads if they are to develop unchecked." 6 ft. 6 in. is suggested as a suitable gauge. The weakness of the proposal is that it assumes that special loads and particular traffic shall rule the situation. Where justified, by all means adopt a new gauge; but one of the difficulties of practical railway working is that so much of the traffic is conveyed in small loads; and the larger

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the capacity of the vehicles the more serious is the problem of providing adequate loading. Where railways can force customers to suit their requirements, such propositions may be sound; but where the trader provides the traffic and expects the railway to carry it substantially to suit his convenience the situation becomes very different.

* * *

Curiosities of Railway Practice.

In a "Pertinent Paragraph" under this heading reference was made in our last issue to stations having six or more platforms, though not of a junction or terminal character. Mr. A. Rannie suggests that Hendon (Midland) and Leicester (Great Central) might also be mentioned. The former is not a passenger junction, but has six platforms. Two of these are, however, served by the goods lines and are not normally used for passenger trains. Leicester (Central) has a through "island," with two bays at each end, thus providing six distinct platform faces. In this instance, however, some of the traffic is terminal. There are also stations such as Esher (London and South Western Railway), provided with extra platforms for racing traffic.

* * *

A New Railway Wagon Sheet Fastener.

In our last issue we described the useful appliance devised by Messrs. John & Richard Jackson, and we are asked to mention that the inventors' address is 18, St. Claire Street, Crewe. They will be pleased to supply further particulars, especially as the device is giving great satisfaction in use.

* * *

The Interest of Railway Travel.

Suggested by various references to curiosities and special features associated with railway journeys "off the beaten track," an Oxford reader sends particulars of a journey he made recently from Oxford to Stratford-on-Avon, his programme being arranged in order to cover as much interesting ground as possible. At a total cost of 9s. 8d. he travelled *vid* four railways. He might also have included the London and North Western Railway, by travelling *vid* Verney Junction, for very little extra cost, but that would have necessitated using the 7.45 a.m. train from Oxford (Bewley Road station). One other feature of interest is that he did not have to "change stations" at any point on the journey. His programme was as follows:—

Oxford	dep.	10.25
Banbury	arr.	10.52
	dep.	10.54
Woodford and Hinton ..	arr.	11.14
	dep.	11.35
Stratford-on-Avon ..	arr.	12.17
	dep.	2.0
Broom Junction ..	arr.	2.20
	dep.	2.34
Evesham	arr.	2.51
	dep.	3.12
Oxford	arr.	4.20

The first train was a Great Central from Southampton, the journey to Woodford and Hinton involving the Great Western and Great Central Railways. Thence to Stratford-on-Avon he used the "S.M.J." Railway, and after spending a short time there he continued to Broom Junction. Thence to Evesham he travelled by Midland Railway, and the return journey was completed by Great Western train to Oxford.

* * *

Workmen's Trains.

A Bill is now before the House of Commons proposing to fix for passengers by all workmen's trains arriving at various stations up to 8 a.m. a maximum return fare between any central station and the outer suburbs up to 20 miles. In reference thereto a writer in *The Times* reviews several interesting features of the workmen's trains movement.

"Probably the first suggestion of workmen's cheap trains emanated from the Eastern Counties Railway, shortly after it had established works near Stratford ('Hudson's Town') in 1847. According to the "Companion to the British Almanack" for 1848:—

> The Eastern Counties Railway Company some time ago offered to one of the societies which have taken up the subject that, if the society would build cottages for working men in the neighbourhood of Stratford-le-Bow, they would convey the workmen by railway to and from London for a charge of only a half-penny per day each.

"The principle, however, was first recognised in the North London Railway Act, 1861. The company were at all times after the passing of the Act—Sundays, Christmas Days, and Good Fridays alone excepted—to run a train every morning and evening between Broad Street and Kingsland, not later than 7 a.m. or earlier than 6 p.m., at such hours as might prove most convenient to the working classes, and at prices not exceeding 1d. per passenger for each journey.

"In 1883 the Board of Trade issued a report on the subject of workmen's trains on twelve London lines. At that date only six companies were under specific statutory obligations to run such trains.

"The report furnished a summary, as shown below, of the trains required to be run by Act of Parliament, and also of those actually running on the whole of the Metropolitan lines in 1882. Both the number of trains and their mileage were calculated for the morning journeys only, as workmen were allowed to return by the ordinary third-class trains at any time after a certain hour, usually 4.30 p.m., and noon on Saturdays.

	Required by Act.		Actually Running.	
Company.	No. of trains.	Mileage.	No. of trains.	Mileage.
G.E.R.	5	25	23	117½
L.C. & D.R.	1	3½	13	93½
Met. R.	2	10	12	71½
Met. Dist. R.	1	5½	5	28
N.L.R.	1	2	5	10
L.B. & S.C.R.	1	4½	32	217½
G.N.R.	—	—	3	32½
L. & S.W.R.	—	—	12	125½
S.E.R. ..	—	—	2	17½
Grand Total	11	50½	107	714

"In the Session of 1883, however, the old order of things was swept away by the passing of another Cheap Trains Act. This important piece

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of legislation repealed the old provision requiring one 'Parliamentary' train a day in each direction, and instead bound the companies to provide what, in the opinion of the Board of Trade, is a 'due and sufficient proportion' of accommodation at fares not exceeding 1d. a mile; while it compelled the companies to run 'proper and sufficient' trains for workmen going to and returning from their work at such fares and at such times between 6 p.m. and 8 a.m. as may appear reasonable to the Board of Trade, the matter being taken before the Railway Commission for final settlement if required. All fares of 1d. a mile were made exempt from passenger duty, and the limitations which under previous Acts were attached to the exemption of cheap trains were consequently repealed. Holders of workmen's tickets as a rule, are now allowed to return by any train after 12 noon."

* * *

The Gauge Problem in Australia.

In view of the numerous references to break-of-gauge problems which have been made of late, Col. Chas. Evans, C.M.G., Commissioner for Railways in Queensland, has sent out an interesting statement on behalf of the 3 ft. 6 in. gauge and the difficulties which are usually quoted as arguments in favour of unification of gauge in Australia. He points out that "on December 31st last there were in Australia nearly one thousand more miles of 3 ft. 6 in. gauge railway than the two wider gauges added together, the figures being:

3 ft. 6 in. gauge	..	9,562 miles.
4 ft. 8½ in. ,,	..	4,061 ,,
5 ft. 3 in. ,,	..	4,520 ,,

It must also be remembered that at the end of last year there were in South Africa 7,760 miles of 3 ft. 6 in. gauge and 474 miles of 2 ft. lines, while in India there are no less than 14,375 miles of metre gauge and 2,525 miles of narrower lines. The 5 ft. 6 in. gauge lines in India total 17,634 miles, or only 734 miles more than the narrower lines, and it is worthy of note that some short sections of 5 ft. 6 in. lines have been converted to the metre gauge, in order to avoid transhipment.

"Doubtless it would be a convenience to be able to send mails, etc. throughout Australia on one gauge, but the advantages from a passenger point of view are not so great as is commonly supposed. In Canada and the United States the same carriages run through from sea to sea, but it must be admitted that it would be a comfort to the passenger to change trains two or three times *en route*, same as is done when crossing Siberia (although there is no break of gauge there); and in Australia it is certainly pleasant to change into a fresh, clean train after being all day in one carriage. It is true that the handling of goods at the stations where the gauges change causes some delay and expense, but the extra cost for the amount of traffic which crosses the borders would not go far towards paying interest upon the cost of making the gauges uniform. Probably we shall have one gauge between Sydney and Brisbane, but do not think the 3 ft. 6 in. gauge long trunk lines in Queensland will ever be "ruled out"; in fact, Parliamentary sanction has been granted for the building of 1,855 more miles of 3 ft. 6 in. line in this State, and several hundred miles more in South Australia and West Australia.

"It is undeniable that the transport of troops over long distances could be carried out in less time with a uniform gauge, but in my opinion the advantages are over-estimated, as men and horses can easily walk out of one train into another, and it would be far cheaper and more expeditious to provide several depôts at convenient centres, with duplicate stocks of guns, ammunition and stores, rather than alter the lines to provide a uniform gauge throughout and transport enormous quantities of warlike material for great distances from one State to another."

* * *

The Possibilities of the 3 ft. 6 in. Gauge.

Continuing, Col. Evans points out that "the possibilities of the 3 ft. 6 in. gauge have not by any means been reached in Australia; a great deal more can be done (and no doubt will be) as the roads are improved in the future. It is not only the width of the track which governs the speed of the engine load, but curves, grades, weight of rail and general stability of the road. On the metre gauge lines in India heavy loads are common; on parts of the Bengal and North Western line, for instance, goods engines haul 800 tons, while on the Rajputana-Malwa Railway the load is 600 tons, and on the Madras and Southern Mahratta line 450 tons. The heaviest passenger engine we have in Queensland (4–6–0) weighs (with tender) 80 tons 14 cwt., and the heaviest goods engine (4–8–0) 91 tons; the axle-load is 12 tons on 60 and 75 lb. rails. The heaviest engines on the wider gauges in New South Wales and Victoria weigh 109 tons (with tender); in South Africa we find 4–6–2 engines weighing 117½ tons, and 4–8–2 engines weighing 142 tons 14 cwt., while the immense 2–6–6–2 engines of the Mallet type turn the scale at 153 tons 19 cwt. On the 4 ft. 8½ in. gauge lines in Great Britain the majority of the engines now being built range (with tenders in working order) between 100 and 120 tons, and few are heavier than that, so that South Africa with its 3 ft. 6 in. gauge is well to the fore, in fact, she has no less than 190 engines with a tractive force of over 30,000 lbs. each; her railways carried an immense traffic during the Boer War, and did the work well.

"The carriages built during the last few years in Queensland are 8 ft. 9 in. in width, while in South Africa they are 9 ft. on the 3 ft. 6 in. gauge. The best coaches in New South Wales and Victoria are 9 ft. 6 in. wide. I am aware that still more roomy carriages have been built in some other countries, but what we have to consider is not so much what is possible upon the wider gauges compared with the 3 ft. 6 in., but what is actually being done at the present time, and the vehicles now running in Queensland and South Africa are wider than the great majority of carriages on the 4 ft. 8½ in. gauge in Great Britain.

"The loading gauge for goods wagons in Queensland is 9 ft. 4 in. in width, which is 4 in. wider than on most of the lines in Great Britain, but 9 ft. 8 in. is allowed in New South Wales and Victoria. I have not particulars of the 3 ft. 6 in. loading gauge in South Africa, but

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they have wagons of great capacity, there being no less than 3,000 carrying a load of over 30 tons (of 2,000 lbs.); 441 carrying a load of over 40 tons, and some of the hopper wagons carry 50 tons.

"What we require in Queensland is length of railway, not width; we have an immense area of country (670,500 square miles), and more railways are required to develop and make it reproductive. The average cost of our lines (including buildings and rolling stock) has been £7,036 per mile, whilst in New South Wales the average cost is £14,670, and in Victoria £13,067. Queensland has spent about £32,000,000 on her railways, which is heavy for a population of about 640,000 souls, but if we had spent as much per mile as New South Wales the capital would have been over £64,000,000; to put the matter another way, for an expenditure of £32,000,000 we should only have had about half our present length of railway. The lines in South Africa have averaged £10,113, and in New Zealand (also 3 ft. 6 in. gauge) £10,864 per mile. The latest published figures shew that South Africa earns £1,489 and New Zealand £1,400 per mile per annum, whilst the wider gauges in New South Wales and Victoria earned £1,743 and £1,430 per mile respectively. Queensland, with its large area and fewer people, earned only £763 per mile, and a wider gauge and consequent greater expenditure would not bring us more traffic. It is also interesting to note that the 3 ft. 6 in. gauge lines in South Africa and New Zealand earned 8s. 8¼d. and 8s. 9½d. per train mile respectively, whilst the wider gauges in New South Wales and Victoria earned 7s. 0½d. and 7s. 3¾d. respectively; Queensland earned 5s. 9½d. per train mile, and its expenditure per train mile was also considerably less than in the other countries mentioned."

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Traffic Developments on the South Eastern and Chatham Railway.

SEVERAL important alterations affecting the weekday seaside services of the South Eastern and Chatham Railway will come into force on June 8th as follows: 9.7 a.m. Charing Cross to Folkestone and Dover expedited to arrive 20 minutes earlier; 3.25 p.m. Charing Cross to Folkestone, Dover, Deal and Sandwich, started at 3.0 p.m. and expedited; the 4.50 p.m. Charing Cross to Hastings express, expedited 20 minutes and through coach for Bexhill provided; 5.32 p.m. Victoria to Faversham extended to Whitstable and Herne Bay and expedited; 6.16 p.m. Cannon Street to Ramsgate Harbour expedited to reach Margate, Broadstairs and Ramsgate 30 minutes earlier; 6.10 p.m. express, Victoria to Ramsgate Harbour started at 7.0 p.m.; New Express Train at 10.0 p.m. to Kent Coast Branch with connection to Canterbury; New Fast Service on Mondays, from Ramsgate Harbour at 6.30 a.m. calling at Broadstairs, Margate West, Herne Bay and Whitstable and reaching Cannon Street at 8.35 a.m.; New Express Service from Ramsgate Harbour 8.45 a.m., Margate West 9.3 a.m. arriving Holborn Viaduct 10.40 a.m.: 9.5 a.m. Dover to Victoria expedited 25 minutes. Above alterations will give express services London to Kent Coast at 4.0 p.m., 5.10 p.m., 6.16 p.m., 7.0 p.m., 8.15 p.m. and 10.0 p.m.

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A Magnetic Levitated Railway.

RECENTLY the daily press has had a good deal to say on the subject of the Bachelet "levitated" railway. Actually it is devised for the transport of mails on the principle of the pneumatic lines at present laid in many places; and on this basis, in conjunction with the fact that direct magnetic attraction is utilised for tractive purposes, the claims advanced for speeds of 300 miles or so an hour can perhaps be appreciated. The car is of steel or with a steel cased body and is supported on a base including aluminum plates. By means of repulsion coils below the track the car is lifted above the road bed and thus runs virtually frictionless. At intervals arched coils are placed over the track so disposed that the car is always under two of them, and current is switched on and off by means of contact brushes or shoes co-acting with the guide rails, which actually have little else to do, so that the car is attracted to each arch in turn, current then being switched off and the car running by momentum to carry it into the influence of the next. In support of his scheme M. Bachelet demonstrates a number of interesting experiments, including the raising of a steel disc, which is itself usually attracted to the coil, by the stronger power of repulsion exercised upon a sheet of aluminum below it. Other experiments gave some remarkable 'levitation" results. Whether the installation will be applicable in a large scale and satisfy economic consideration in standard railway application remains to be seen, especially as support by repulsion is largely an equivalent to power required to overcome frictional resistance and under other conditions. But on laboratory scale, interesting results are given and probably for mail transport as suggested there may be possibilities.

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Staff Changes on the London and North Western Railway.

THE following staff changes on the London and North Western Railway are notified: Mr. L. Speakman has been appointed Outdoor Goods Manager (Northern Division) in succession to Mr. Warner, who has resigned; Mr. E. Wharton has succeeded Mr. Speakman as District Goods Manager at Birmingham; Mr. T. E. W. Guest has succeeded Mr. Wharton as District Goods Manager at Warrington, and Mr. E. Goulborn has succeeded Mr. Guest as District Traffic Superintendent at Swansea.

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In connection with the joint Lancashire and Yorkshire and North Eastern Continental services between Hull and Zeebrugge, by the *Duke of Cornwall* leaving Hull (Riverside Quay) every Wednesday and Saturday at 5.50 p.m., from May 30th to June 24th inclusive, and on Tuesdays, Thursdays, and Saturdays, commencing June 27th, a through lavatory corridor train leaves Liverpool (Exchange) at 2.10 p.m., Manchester (Victoria) at 2.55 p.m., Brighouse at 3.39 p.m., and Wakefield at 3.59 p.m. for Hull (Riverside Quay) in connection with the steamer to Zeebrugge. The 1.20 p.m. train from Preston, 2.0 p.m. from Blackburn, 2.22 p.m. from Accrington, and 2.39 p.m. from Burnley (Manchester Road) to Todmorden stops at Stansfield Hall at 3.1 p.m. daily, commencing May 30th, and on Wednesdays and Saturdays is extended to Wakefield from May 30th to June 24th inclusive, and on Tuesdays, Thursdays, and Saturdays only commencing June 27th, stopping at Brighouse at 3.25 p.m. This train conveys a through carriage for Hull (Riverside Quay). In connection with the return service from Zeebrugge Quay every Monday and Thursday at 6.15 p.m. from June 1st to 25th inclusive, and on Sundays, Wednesdays, and Fridays, commencing June 28th, a through train will leave Hull (Riverside Quay) at 8.35 a.m. on Tuesdays and Fridays from June 2nd to 26th inclusive, and on Mondays, Thursdays, and Saturdays only, commencing June 29th, after the arrival of the steamer from Zeebrugge, for Wakefield, Todmorden, Burnley, Accrington, Blackburn, Preston, Manchester (Victoria), and Liverpool (Exchange). The Continental boat trains to and from Hull arrive at and depart from Riverside Quay station, alongside which the steamer is berthed, enabling passengers to pass direct between the trains and steamer under cover. Luggage is transferred free of charge. At Zeebrugge the express boat trains to and from Bruges, Ghent, Alost, and Brussels depart from and arrive at "The Quay Station," alongside which the steamer is berthed, which enables passengers to pass direct to and from the steamer at all states of the tide.

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Mr. Frank Potter, General Manager, Great Western Railway, has again offered a prize of ten guineas for an essay competition. The Committee of the Great Western Railway (London) Lecture and Debating Society also renew their offer of a second prize of five guineas and three consolation prizes in the form of books. The General Manager's prize will be open for competition to all members of the company's salaried staff, and the other prizes will be restricted to members of the Society. The following are the conditions of the competition:—

1. The subjects of the papers submitted to be chosen from the following list. Competitors may contribute essays on any number of the subjects shown:—
   (*a*) Railway education.
   (*b*) The position of railway companies as ratepayers.
   (*c*) The main responsibilities in station management.
   (*d*) The development of railway travel in this country.
   (*e*) The prevention of unnecessary haulage of empty rolling stock.
   (*f*) How could better loading of goods wagons be secured?
2. Papers to be limited to 5,000 words, which must be written or typed on one side only of the paper (foolscap size), and sent to the Honorary Secretary, General Manager's Office, Paddington, not later than July 31st, 1914.
3. The papers to be judged by a Committee nominated by the General Manager.
4. Papers should be signed with a *nom-de-plume*, and not bear the author's name. The envelope containing the paper should be sealed, and bear on the back the *nom-de-plume*. Another envelope, also sealed and endorsed with the *nom-de-plume*, containing the author's name and address, and, if a member of the Society, the number of his membership card, should be sent to the Honorary Secretary.
5. All the envelopes to remain unopened until they are handed to the judges.

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The seventh annual Bohemian concert organised by the Metropolitan Railway in aid of the Railway Convalescent Homes at Herne Bay and Leasowe Castle, was held at the Queen's Hall on Thursday, April 30th. The Rt. Hon. Lord Aberconway, P.C. (Chairman of the Metropolitan Railway Company), presided. The Railwaymen's Convalescent Homes (Kent and Cheshire) are owned and managed by the railwaymen of the United Kingdom. They exist for the purpose of providing rest and change for members of the railway service convalescent after sickness or injury. Nearly the whole of the income is contributed by railwaymen, and only men still actively employed on railways are admitted. No eligible case has ever yet been refused admission. Thanks to their local committee (who give their services entirely without fee or reward), the staff of the Metropolitan Railway have associated themselves with the Homes since

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the earliest days, and in the course of twelve years the Metropolitan Railway staff contributions have amounted to a total of £1,069, while of the patients 314 have been Metropolitan men. There was a large attendance, and the lengthy programme reached a very high level of excellence. During an interval Lord Aberconway explained the objects of the Convalescent Homes and spoke of the relation of the Metropolitan Railway thereto. Since the Home at Herne Bay was opened in June, 1901, more than 21,000 sick and injured railwaymen have been received as patients. Every week-day in 1913 brought to the Homes on an average ten new patients, a total of 3,217 being received in that year. He was glad to be able to say that a very large proportion of the staff of the Metropolitan Railway contributed in some way or another towards the upkeep of the two Homes. During the last five years 200 members of the staff of the Metropolitan Railway had been admitted as patients into the Homes, and the support given by the men had been gradually increasing, and averages about £150 a year.

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THE final ambulance competition for the Great Western Railway Directors' Challenge Shield and prizes was decided in the General Meeting Room at Paddington station, on April 17th, and following the announcement of the result of the contest and presentation of the competition trophy, the awards for exceptionally efficient First Aid rendered by the members of staff during the year 1913 were distributed. During the month of March preliminary sectional competitions had been held at various points throughout the system. The entry for the competition was a record one (116 teams). The six teams obtaining highest marks in the sectional contests again met in the final competition, when Drs. J. M. Carvell and R. Main were the judges. Many of the chief officers of the company and others engaged in the Paddington offices attended to witness the contests, and the work of the teams was followed with considerable interest. The prizes offered in the Final Competition were:—For Stretcher Teams of Five Men: First Prize, £5 and silver medal to each member of winning team (holders of the Directors' Challenge Shield for one year); Second Prize, £3 15s.; Third Prize, £2 10s. The result was as under:—

	Team.	Marks. (Max. 330)
First Prize,	Oxford No. 1	269½
Second Prize,	Newport Dock Street (Traffic)	263
Third Prize,	Swindon	236
	Birmingham No. 1 ..	220
	Landore	196½
	Birmingham No. 3 ..	192½

In respect of exceptionally efficient First Aid rendered during 1913 the Gold Medal and Certificate for the best case was awarded to Foreman Porter Henry E. Norman, of Honeybourne. A silver medal and certificate were awarded to Checker Wallace R. Morris, of Hereford, and a bronze medal and certificate to Labourer Charles A. Bryan, of Westbourne Park.

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SIR ROBERT TURNBULL was recently presented at a meeting of the Railway Clearing House Superintendent's Conference with a testimonial, consisting of an old oak bookcase, from the members of the Conference. Mr. Clow (Great Central Railway), Chairman of the Conference for the current year, made the presentation on behalf of the subscribers, and said it was a pleasant duty he had to perform in formally asking Sir Robert to accept the bookcase. He referred to Sir Robert's long connection with the Conference, and expressed the best wishes of all the members for his future welfare. Mr. Cockburn (Glasgow and South Western Railway) claimed a long friendship with Sir Robert, and, speaking as the oldest member of the Conference, said it had been the greatest pleasure to be associated with that gentleman in business matters, as he had always shown the highest capacity, and had all the qualifications which go towards making a man acceptable and ideal. He concluded by saying that Sir Robert enjoyed the premier regard of the officers of all the railways in Great Britain, and that the members of the Conference parted with him with the greatest regret, and hoped he would enjoy long life and happiness. Mr. Watson (North Eastern Railway) and Mr. Aldington (Great Western Railway) cordially supported the remarks made by the previous speakers. Sir Robert, in responding, said that it was with the greatest regret that he had to sever his connection with the Conference, that he had much appreciated the kind words which had been said, and the feelings which had caused the members to present him with the bookcase, and that his association with the Conference would remain with him as one of his most pleasant memories.

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THE fifty-sixth annual dinner of the Railway Benevolent Institution was held at the Hotel Metropole on May 4th, Lord Wolverton presiding. The Institution provides for the necessitous widows of railwaymen, and maintains and educates their orphan children; annuities and money allowances are granted to widows and also to members who, through old age, disease or accident, are unable any longer to work for their living. Since the establishment of the Institution in 1858, assistance has been rendered to 179,584 persons as under: 6,077 widows of men killed; 18,692 widows of men dying of sickness; 150,790 men injured by accident; 3,576 men disabled by old age and other causes; 449 children and other dependants incapable of earning their living, and also incapacitated women employés; and, in addition to these, 4,166 widows and disabled servants have received pensions of from £5 to £30 per annum; 2,155 children of both sexes have been educated and maintained. At the present time 2,289 widows and members are receiving annuities which alone involve an annual liability of £38,456, and 376 children are being reared, trained, and educated in the Orphanage at Derby and at other schools at a cost of nearly £9,000 per annum. The Railway Benevolent Institution, which is open to all classes of men on all lines of railway in Great Britain and Ireland, is officially recognised and assisted by the railway companies, controlled and managed by their chief officers, and, after careful investigation, every proper case is promptly and sympathetically relieved as far as the funds will allow.

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GOOD progress is being made at Dover in reference to the new marine station. The formation of the station site has involved the reclamation of an area having a maximum length of 2,300 ft., with a maximum width of 350 ft. A sea face, of huge concrete blocks, was constructed, the space between the new wall and the old pier being then filled in. For carrying the station a system of piled foundations was adopted, the piles (of ferro-concrete) being driven through the chalk filling to the old sea bed beneath, and the heads connected together by reinforced concrete slabs and beams upon which the new buildings and walls could rest. The station comprises two island platforms, each 60 ft. wide and about 700 ft. long, accommodation thus being given for four trains simultaneously. Three blocks of buildings are being erected on each platform, each block being 100 ft. in length and 25 ft. in width, and these will afford ample space for the various waiting rooms and offices that will be required. There will be two main berths for embarking and disembarking passengers, as well as one for emergency purposes. A coaling berth will also be provided. Passengers will proceed to the main berths from the platforms by walking down a ramp at the seaward end of the platforms, one berth being approached almost directly and the other by a covered corridor. Access to the emergency berth will be obtained by means of a footbridge from the platform nearest the quay. At each of the passenger berths awnings extending as far as possible across the quay towards the boats will be provided for the purpose of giving shelter to the passengers.

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THE "Norfolk Broads" constitute one of the unique pleasure grounds of England, and the Great Eastern Railway is concerned with a very large volume of traffic associated therewith. Nearly every principal point of access thereto is served by Great Eastern main line or branch trains, and good facilities in the way of tourist, fortnightly, excursion, circular tour and local season tickets are offered to enable the Broads to be explored. But to see this wonderful system of waterways properly it is necessary to traverse them by water, and prospective visitors are advised to communicate with the Norfolk Broads Yachting Company, Ltd., of Queen Street, Norwich, in view of the comprehensive arrangements available for visitors. Yachts, pleasure wherries, motor boats and small sailing and rowing boats can be hired, either at the various centres of the company as required, or chartered for a week or a fortnight or more. Most of the boats have been specially designed and fitted to suit their special work, and the charges are very reasonable. At Wroxham, "The Queen of the Broads," the company has a large depôt, and this place is directly served by Great Eastern main line trains. Potter Heigham is another good centre, described as "The Heart of Broadland." Boats of all kinds and to suit all purses, with or without a skilled navigator and staff, can be hired from the company, and prospective visitors are recommended to write to the Secretary, Mr. F. S. Culley, at the address mentioned, for particulars of the company's arrangements and list of vessels.

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CAPTAIN CHURCHWARD has retired from the position of Continental Agent, South Eastern and Chatham Railway, after occupying this important position for 25 years. He represented the South Eastern and Chatham Railway in Paris on the visit of King George and Queen Mary on their recent visit to the President of the French Republic. On leaving Paris His Majesty promoted Captain Churchward from the Fifth to the Fourth Class of the M.V.O. Captain Churchward comes of a family closely associated with the Dover-Calais services, being the third son of the late Mr. J. G. Churchward, formerly of Kearnsey Abbey, Dover, contractor for the British, French and Belgian mails between Dover, Calais and Ostend. He held a commission in the 1st Royal Surrey Regiment, but resigned this to enter in 1873 the service of the Chatham and Dover Railway as assistant at Calais. He was then appointed Superintendent at Queenborough Pier for the Queenborough and Flushing route, and promoted to Paris, where, in due course, on the fusion of the two old companies, he became their joint agent. He is a Knight in the French Order of the Legion of Honour. Captain Blomefield, Marine Agent of the South Eastern and Chatham Railway at Calais, has also retired.

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AT the last annual meeting of the Midland Railway Company, the Chairman (Mr. G. Murray Smith) stated that it had been decided by the Directors to establish a savings bank for the convenience of their employés. The staff have now been notified by circular that this bank is now constituted, and will be available for all persons in the service of the Company, their wives, and all members of their families living with and dependent upon them. Superannuated and pensioned depositors may continue their accounts, and the widows of deceased depositors may during their widowhood become depositors or may continue accounts already opened. There is no limit to the amount which may be deposited at one time, nor to the total deposits of a single depositor. Every depositor will have the option of making his deposits (1) by deduction from salary or wages, (2) by payment to the authorised receiver at his station or depôt, (3) by direct payment to the chief inwards cashier at Derby. Interest on deposits will be allowed at the following rates per annum: 4 per cent. on sums up to and including £250; 3½ per cent. on sums over £250 up to and including £500; and 3 per cent. on all sums over £500.

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AN enterprising society is the London and North Western Railway (London) Athletic Club. Its latest development is the addition of an amateur operatic and dramatic society as a branch of the club. The members gave a performance of "Liberty Hall," under the stage direction of Mr. Basil Mercer, at Cripplegate Theatre, London, E.C., on Monday, April 27th. The well-known play in four acts went without a hitch and was indeed a highly creditable performance. The caste included the Misses C. Barnes, F. Owen, I. Stevenson and Mrs. Houghton; Messrs. W. E. Cranmer, G. F. Telfer, H. A. Ludlow, P. Reed, T. H. Green, V. F. Hare, S. Harding, J. W. Harris and Mr. Harold Bentley. The latter gentleman, with Mr. Arthur Parker, were assistant stage managers, while the Company were fortunate in securing

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the services of Mr. D. H. F. Meacock as hon. acting manager. An excellent programme of music was performed between the acts by the London and North Western Railway orchestra, under the direction of Mr. David J. Thomas. The next performances by the dramatic society will be on November 23rd and 24th, when the famous comic opera "H.M.S. Pinafore" will be staged.

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Two new coal conveyors are being erected at Tyne Dock, designed by Mr. Vincent L. Raven, Chief Mechanical Engineer, North Eastern Railway. Coal is fed from bottom-door wagons into a hopper, and thence to the ship. The capacity of the hopper is 10 tons, and it extends into an extension piece hinged to the mast, and is so arranged that it may follow any upward or downward movement of the jib. At the point where the door feeds on to the extension piece a door is fitted which regulates the supply of coals to the belts, this door being operated by means of screw gear on the staith decking above. Special safety devices have been fitted to prevent overrunning, as well as interlocking, and safety devices to minimise the risk of accident. Coal can be discharged with the conveyor resting at an angle of 25 deg. above and 40 deg. below the horizontal, or at any intermediate angle. The appliances will be fixed on the sites of the gravity spouts at the north end of No. 4 jetty. Improvements have also been effected at several of the gravity spouts, thereby much facilitating the shipping operations.

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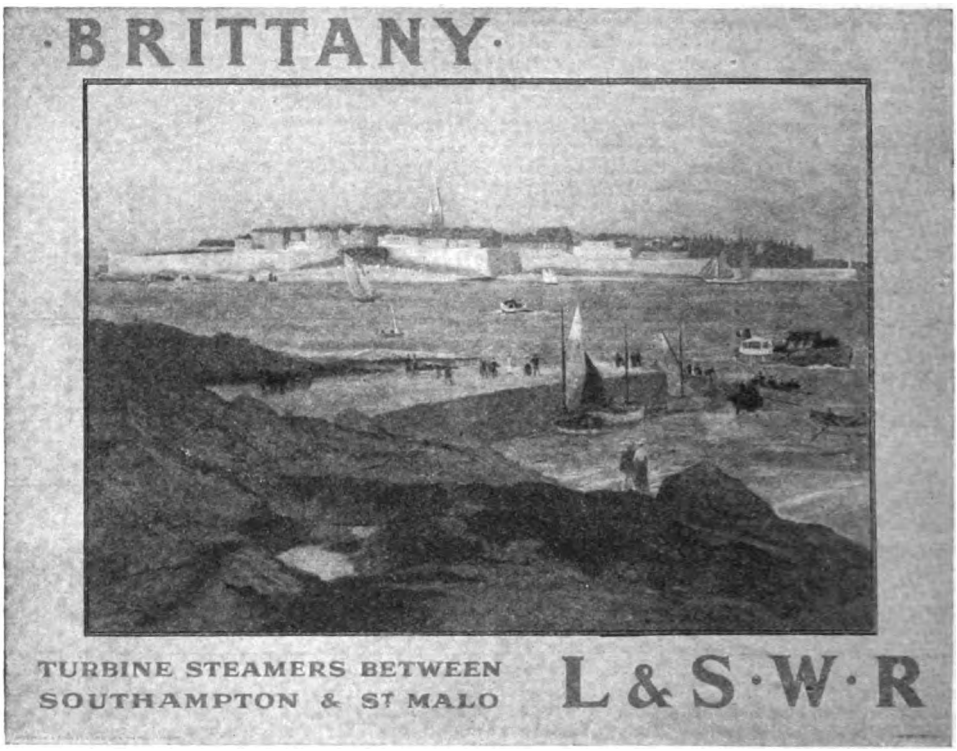
THE first innovation introduced by the Great Eastern Railway since the appointment of Mr. H. W. Thornton, as General Manager, came into force on Sunday, May 10th, when two new early trains were dispatched from Liverpool Street carrying Sunday newspapers. These trains will run every Sunday, so that many of the towns and districts served now will obtain Sunday newspapers at breakfast time instead of 12 or 1 o'clock as hitherto. The new arrangement is the result of a deputation of representatives of London Sunday newspapers, which recently waited upon Mr. Thornton. The first train leaves at 3 a.m. for Yarmouth. It reaches Chelmsford at 3.39, and, passing through Colchester, Ipswich, Stowmarket, and Norwich, arrives at Yarmouth at 6.30. Under the old system the Sunday papers did not reach Yarmouth until 1.30. The second train leaves London at 5 a.m. for Broxbourne and Bury St. Edmunds, a route which touches many important centres, such as Bishops Stortford, Cambridge, and Newmarket. By this train also newspapers will reach their destination four or five hours before they did under the old system.



ONE OF THE NEW 1914 POSTERS ISSUED BY THE LONDON AND SOUTH WESTERN RAILWAY.
The original is beautifully produced and the colour effects particularly good.

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"EARLY HOLIDAY RELECTIONS" is the title of an appropriate booklet issued by the Publicity Department of the London and South Western Railway. Briefly it sets forth the advantages of the earlier holiday movement, at the same time directs attention to "Ideal Scenes for Early Holidays" easily reached by the London and South Western Railway. It is well produced, with numerous illustrations, and the booklet is one to be preserved and referred to. Another booklet equally attractive, is entitled "By the Cornish Sea" with the sub-title of "King Arthur's Land." Applying to London residents, a new booklet entitled "Homes in the South West Suburbs," is equally commendable in its way, while the well-known booklet "In the Track of the Mayflower, back to the Old Country" reappears as a new production for 1914. Copies of these, as also of other publications issued by the Company, can be had on application to Mr. Henry Holmes, Superintendent of the Line, at Waterloo station.

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TWO of the 4-4-0 passenger tender engines of the Somerset and Dorset Joint Railway, Nos. 70 and 71, have recently been rebuilt at the Derby works of the Midland Railway. As re-constructed, these engines incorporate the leading features of the two Midland locomotives which ran over the Somerset and Dorset line last year. The diameter of the driving wheels is now 7 ft. 1 in. and new boilers with Belpaire fireboxes and superheaters are provided. A mechanical lubricator is also fitted. These engines were first put into service at the end of 1903, and marked the commencement of the era of large boilers on the Somerset and Dorset line. In rebuilding, the brass number plates have been removed, and the number painted on the cab sides, following the practice inaugurated with the new mineral engines. Some of the older goods engines on this line are being provided with increased boiler power. The large goods engines of the 2-8-0 type are now working regularly on mineral traffic to and from Bath.

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THE Fifeshire County Council have formally approved a loan of £2,000 from the Cupar District Committee to the Falkland Light Railway Company, subject to the adjustment of terms: and the Aberdeen District Committee of the Aberdeenshire County Council have instructed a sub-committee to report as to the advisability and cost of constructing a light railway from Aberdeen to Newburgh. At Fraserburgh the town council have appointed a special committee to watch over the interests of the burgh in connection with the proposed light railway from Maud to Turriff, and at Stonehaven strong representations are being made to the railway companies concerned in favour of a light railway, 10 miles long, from Stonehaven to Bervie, which would serve an extensive agricultural district between the two towns.

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THE leading article in the *Bulletin of the International Railway Congress Association* for April, is an article written by Mr. J. F. Gairns (Editor of the RAILWAY MAGAZINE and RAILWAY YEAR BOOK), reviewing "British Locomotives in 1913: Designs and Work." A comprehensive review of all new locomotives built last year is given, with illustrations of eight designs. In addition drawings are given showing the Schmidt Superheating Co.'s steam circulating system whereby damper mechanism is rendered unnecessary, and of the Horwich "Top and Bottom Header" and "Twin-Chamber Plug Header" superheaters. In conclusion particulars of a number of notable examples of locomotive performances are briefly reviewed.

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EXCEPT to residents in Liverpool, Birkenhead and district, the Wirral Peninsula is comparatively unknown; yet it has many places of great interest, including New Brighton, Seacombe, West Kirby, Bidston, Hoylake, Wallasey. By means of the Wirral Railway, and its connecting lines, the Mersey and Great Central in particular, all these districts can be conveniently visited, rapid services, favourable facilities, excursion rates and other arrangements assisting the exploration of this interesting district. A neat booklet giving particulars of these and other arrangements can be had on application to Mr. J. H. Burns, Traffic Manager, Wirral Railway, New Brighton station.

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AT the ordinary annual general meeting of the members of the Midland Railway Superannuation Fund Association, an announcement was made that the Directors in pursuance of the powers conferred upon them by the Midland Railway (Superannuation Fund) Act of 1913, will contribute a further sum equal to 2 per cent. on the salaries of the members, in addition to the sum equal to 2½ per cent. on the salaries of the members prescribed by the Act, such further contribution to be made as from February 1st, 1912. This means an addition to the Fund of about £20,000 per year, which will be paid out of the revenue of the Company.

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THE Board of Trade have recently confirmed the following Order made by the Light Railway Commissioners:—North Staffordshire Railway (Trentham, Newcastle-under-Lyme, and Silverdale Light Railways) Order, 1914, authorising the construction of Light Railways in the County of Stafford, from Trentham to Newcastle-under-Lyme and Silverdale, with the reconstruction and working of certain Branch Railways of the North Staffordshire Railway Company as Light Railways under the Light Railways Acts, 1896 and 1912, and for other purposes.

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MR. A. WOOLFORD, Deputy-Vice-Chairman, read a valuable paper, "Pumps and Injectors for Feeding Locomotive Boilers," before the members of the Institution of Locomotive Engineers, at Caxton Hall, Westminster, on Saturday, April 25th. The same afternoon the members of the Institution visited the Battersea Works of the New Transport Co., Ltd., where demonstrations of the appliances designed for the suggested goods clearing house were given by Mr. L. Rottenburg, one of the Directors, and Mr. Lloyd, chief draughtsman to the company.

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AS usual, comprehensive arrangements will be made by the Cambrian Railways, and in conjunction with other railways connecting therewith, for the Whitsuntide holiday traffic. On Saturday, May 30th, a special through fast excursion has been arranged, leaving London (Euston) at 11.35 a.m. and Paddington at

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12.3 (noon) for Aberystwyth and other Cambrian resorts, and excursion tickets, available for 17 days, will be issued at cheap rates. Similar cheap facilities will also be offered from London to the Central Wales Spas.

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An arrangement has been made between the Isle of Wight Central, and Freshwater, Newport and Yarmouth Railways for the through working of the latter company's trains into and out of the Isle of Wight Central station at Newport. Visitors to the Island will not this year have the inconvenience of trudging along a dusty and narrow foot-path between the two stations, a matter which caused so many complaints last summer. Following the lead of the Isle of Wight Central, the Isle of Wight Railway have also announced their intention of issuing 3rd class penny-a-mile tickets by all trains between all Stations, commencing on June 1st so that visitors this year will be able to take advantage of the uniform fare throughout the Island applicable by all trains. In view of these important developments, and in anticipation of the large influx of visitors, the Island Railway Companies are bringing their summer service into force on and from June 1st this year instead of July 1st as hitherto and it is hoped that the result will encourage them to make this a permanent arrangement in future. The Isle of Wight Central Railway are this year issuing Weekly Season Tickets available between all stations on their railway for seven days at 7s. 6d. first class and 5s. third class, a remarkably low figure considering the number of journeys and the distance which it is possible to travel with these tickets.

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Excellent arrangements have been made by the Furness Railway for visitors who intend spending their Whitsuntide holidays in the English Lake District. Cheap fast excursions be run from Euston and St. Pancras on Friday and Saturday, May 29th and 30th, to all pleasure resorts on the Furness Railway with bookings for 3, 4, or 8 days. Excursions will also be run from Birmingham, Liverpool, Manchester, Glasgow, Edinburgh and the principal towns to the Lake District. Special attention is called to the 20 tours through the English Lake district which commence on June 1st. The steamer service between Barrow and Fleetwood will also commence at Whitsuntide. Tourist Weekly tickets are also issued available for an unlimited number of journeys for 7 days. There are 14 golf links adjacent to stations on the Furness Railway, the best known of which is the Seascale course. It is a fine 18 hole course and extends for 5,650 yards along the seashore. Visitors to the Lake District are recommended to stay at the Furness Abbey Hotel. This well appointed and modern hotel is beautifully situated within the grounds of Furness Abbey and commands a series of unique views of the ruins.

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At a recent conference in Paris between representatives of the London, Brighton and South Coast Railway and officials of the State Railways of France, many improvements and accelerations in the services between London and Paris, *via* Newhaven and Dieppe, were arranged to come into operation next year. The morning services from London and Paris will be accelerated by about half an hour in each direction and an afternoon service between London and Paris will be run during the summer months. The State Railways have ordered for these services another fast turbine steamer, to be named the ss. *Versailles*, from the Forges et Chantiers de la Mediterrannee. At the close of the proceedings the Earl of Bessborough, Chairman of the Brighton Railway Company, referred to the appreciation of the English nation of the magnificent reception accorded the King and Queen on their recent visit to Paris. The Minister of Public Works, in reply, expressed the great satisfaction that their Majesties' visit had afforded and the impetus it had given to both the commercial and social affairs of the two countries.

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In connection with the electrical developments on the Brighton Railway, a party of about forty of their workmen, drawn from all ranks in the railway, left recently by the Hook of Holland route on a visit to Germany. The object of the visit is to see the electrical development in that country, and to study the organisation of the shops in the Allgemeine Electrical Works in Berlin. The visit is under the auspices of this important company, who employ some 70,000 workmen. The Chairman of the Brighton Railway Company, the Earl of Bessborough, who has taken an active part in bringing about this useful visit, addressed the men shortly before their departure and impressed upon them the desirability of each member of the party seeing in what way the experience gained by this visit could be best applied with advantage on the Brighton Railway.

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Although only a small line, the Stratford-upon-Avon and Midland Junction Railway is interesting in that it affords convenient connections with so many other railways; and the programme of tourist, week-end, picnic and pleasure party, excursion and like arrangements published by Mr. A. E. Diggins, Traffic Manager, is a comprehensive booklet including many features which will cause its perusal with interest. Readers are advised to write Mr. Diggins, at Stratford-on-Avon, for a copy.

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Speaking at the annual dinner of the Clacton Season Ticket Holders' Association, Mr. H. W. Thornton (General Manager) said that the Great Eastern Railway were putting on a restaurant-car train leaving Liverpool Street at 7.30 p.m. for Harwich with a connection for Clacton due there at 9.27 p.m. Last summer there had been no train between 6.30 p.m. and 8.40 p.m. Also there was to be a connection to Clacton with Ipswich trains which would bring the town more into touch with the North and the Midlands.

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The Great Western Railway have now under construction and in progress of delivery from the Swindon works, additional engines of the four-cylinder 4-6-0 type. No. 4046 is named *Princess Mary* and No. 4048 is *Princess Victoria*. The construction of the new engine shed at Westbury is proceeding, and additional siding accommodation is being provided here.

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THE Lancashire and Yorkshire Railway Tourist Programme for 1914 is prepared upon the usual comprehensive plan, giving particulars of facilities covering all parts of the system as well as the operations of other railways in connection. Copies can be had on application to Mr. A. Watson, Superintendent of the line, Victoria station, Manchester, or at stations and town offices.

* * *

COMMENCING July 1st a luncheon car will be run on the 11 a.m. express from Dublin to Cork, Great Southern and Western Railway, and also on the fast portion of the 12.45 p.m. train from Cork, due at Kingsbridge at 4.20 p.m.

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MR. HENRY FOWLER, Chief Mechanical Engineer, Midland Railway, has been awarded by the Institution of Civil Engineers a Watt Gold Medal for his paper on "Superheating on Locomotives."

* * *

LONDON, Brighton and South Coast Railway Whitsun holiday arrangements are on the usual comprehensive basis, and numerous additional trains and facilities will be provided at that time. A copy of the holiday programme issued by the Brighton Company will be sent post free on application to the Superintendent of the Line, London, Brighton and South Coast Railway, London Bridge. Convenient cheap tickets covering the whole of the holiday will be issued from Victoria, London Bridge, Kensington and suburban stations to all the seaside and health resorts by all trains on Friday, Saturday and Whit-Sunday, May 29th, 30th and 31st, available to return on Sunday, Monday, Tuesday or Wednesday, May 31st, June 1st, 2nd and 3rd. The Pullman 60-minute express, "The Southern Belle," from Victoria to Brighton at 11 a.m., will run on Whit-Monday as usual. *Viâ* the Newhaven and Dieppe route, a special 1 to 15-day excursion to Dieppe, Rouen and Paris will be run *viâ* the Newhaven-Dieppe Royal Mail route. The tickets will be issued on Saturday, May 30th, by a special afternoon express service, also by the express day and night services on Thursday, Friday, Saturday, Sunday and Monday, May 28th to June 1st. Special cheap return tickets to Dieppe will be issued on Friday, Saturday, Sunday and Monday, May 29th to June 1st, available for return on any day up to and including Wednesday, June 3rd. The Casino will be open at Dieppe. Full particulars can be obtained from the Continental Traffic Manager, Brighton Railway, Victoria Station.

* * *

"LOCOMOTIVE Hill Climbing" formed the subject of an excellent paper read by Mr. Cecil J. Allen, at the Railway Club, 92, Victoria Street, London, S.W., at the May monthly meeting. Mr. W. Parker presided over a large muster of members and an animated discussion followed Mr. Allen's well prepared contribution. On Saturday, May 16th, a visit was paid to the Great Eastern Railway engine sheds at Stratford, E. At the monthly meeting on June 9th Mr. J. F. Gairns will lecture on "Railway Signalling: Possible and Probable Developments." The meeting will begin at 7.30 p.m., and visitors—particularly prospective new members—will be welcomed. On June 20th a club excursion will be made to visit Mr. C. W. Bartholomew's Model Railway at Blakesley Hall, Northamptonshire. Full particulars as to train times and special arrangements may be obtained from the Hon. Secretary, Mr. E. J. Miller.

* * *

"HOLIDAY Hints," the Official Illustrated Guide of the London and South Western Railway, has made its sixteenth annual appearance. The London and South Western system, as is well-known, offers to the pleasure seeker a field which may literally be described as infinite in its variety. Beginning with the fertile valley of the Thames, it extends through some of the most picturesque counties in England, and, by means of regular steamboat services, stretches beyond to the Isle of Wight, to the Channel Islands, and to the coasts of Normandy and Brittany. Essential particulars are given in the guide relating to about 90 of the principal resorts, and a list is added of no fewer than 140 golf courses, all of which are reached by trains from Waterloo. Accompanying the letterpress are 26 full-page illustrations and a new map, which shows steamship as well as railway routes. Travellers have the further assistance of a list of 1,800 hotels, boarding houses, and apartments, so that those who may be strangers to particular localties need not fear any difficulty in securing suitable accommodation. The guide has again been prepared by Mr. W. T. Perkins, under the direction of Mr. H. A. Walker, the General Manager, and 50,000 copies are being distributed. These may be obtained free at any of the booking offices, or upon application from Mr. Henry Holmes, Superintendent of the Line, Waterloo station.

* * *

FROM the heart of London through beautiful country to the sea in fifty minutes, is a boon to which the ever increasing number of passengers and season ticket holders at Fenchurch Street, London, significantly testify. To furnish information concerning the holiday and residential districts served, Mr. Bullock, manager of the London, Tilbury and Southend section of the Midland Railway, on application to his offices at Fenchurch Street station, will supply gratuitously, an excellent booklet descriptive of places of interest. The booklet includes a list of the leading hotels, boarding houses, furnished and unfurnished apartments, and farm house lodgings.

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SPEAKING recently before the New York Railroad Club, Mr. George Gibbs, Engineer of the Pennsylvania Railroad, commented upon certain aspects of heavy grade railway electrification in a way which is worthy of careful consideration. He dealt primarily with the Pennsylvania suburban lines at Philadelphia, and the heavy grade electrification of the Norfolk and Western at Bluefield, West Virginia. He described the latter as perhaps the heaviest electric traction scheme proposed anywhere in the world, as yet. The coal traffic of this railway is the important one, and originates in the Flat Top and Pocohontus fields, which lie on the west slope of the Allegheny Mountains. It is the section between Bluefield on the East and Eckman on the West end, a distance of about 30 route miles, or about 90 track miles which is concerned. Within this distance and practically at the summit of the

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Alleghenies, is the Elkhorn tunnel, about 4,000 ft. long; it is a single track tunnel and constitutes the "neck of the bottle," limiting the capacity of the entire road. The alternatives for electrification to relieve congestion were either to double track the tunnel or to build a relief line, both of which would cost a great deal of money and require years of time. The maximum eastbound tonnage at present is about 65,000 tons per day up to the grade, of which about 48,000 tons is revenue traffic—the tonnage, by the way, is exclusive of the ordinary tonnage of the road—it is simply coal tonnage that is referred to. This tonnage is loaded in about 20 train units of 3,250 tons each, trailing load. This train is hauled up a two per cent. grade over the mountain to Flat Top yard by three mallet compound engines; thence, to Bluefield, 15 miles further over an undulating grade with 1½ per cent. maximum by two Mallets. At this point trains are made up for the road run to tide water. The entire 30 miles that is being electrified is what might be called a "gathering division," the tonnage being filled out in the section from the various coal workings, it is, therefore, treated as a separate engine division, and this makes the substitution for electric or steam power unusually advantageous and economical. For these Mallet engines electric locomotives will be substituted, a double electric unit at the head of the trains and a similar one at the rear. The electric locomotives which are being adopted weigh 130 tons, of which 110 tons are on the drivers. As the road has a great amount of curvature, about 40 per cent. of the entire line being on curves up to 12 degrees, leading wheels are provided. The system of electric traction adopted is the single phase with an overhead trolley wire carrying 11,000 volts; on the locomotive the single phase current is converted to three phase, by a "phase splitting" device, thus allowing three-phase induction motors to be used, a type which has certain important advantages for this particular traffic. Transmission of current from the power house is 44,000 volts single phase, which is transformed in sub-stations along the line to the working pressure of 11,000 volts. The power house is a steam plant having a capacity of 27,000 kilowatts and is located at Bluestone, about 10 miles from the end of the division.

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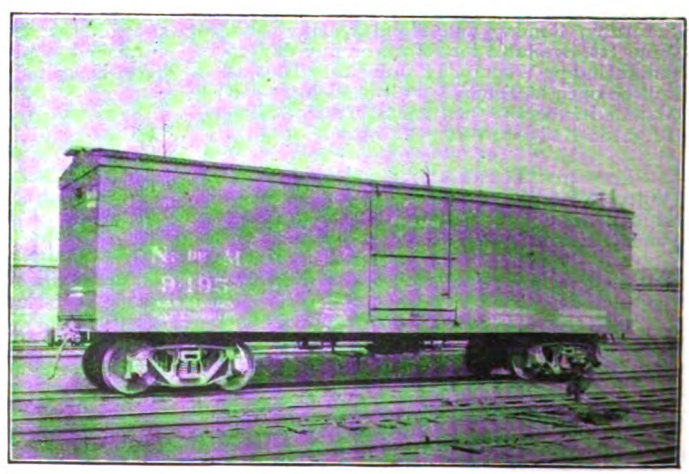
In reference to the Pennsylvania Railroad, Mr. Gibbs stated that as the limit of the capacity of the Broad Street station, Philadelphia, has been about reached, and the question of enlargement has been under consideration for some time, it was found that by the electrification of the suburban service a larger number of empty train and locomotive movements might be eliminated if the suburban service were electrified. The principal points of congestion at the terminal is at the junction of the six suburban routes in the yard outside the house. The gain in station track capacity is not so important as the congestion in the yard, but the gain here will amount to an equivalent of about two station tracks and, of course, is not negligible. Initially the Broad Street Paoli service only is being electrified, 20 miles of four track route. This will be followed, probably, by the conversion of the Chestnut Hill line, as business conditions warrant. The electrification will be on the single phase alternating current system, with 11,000 volt trolley wires; trains will be of motor cars.

* * *

Every city of importance on the Pacific coast between Alaska and Mexico is being invited to participate in the celebration that is to mark the opening of the Panama Canal next year. It is planned to have a "Convention of the Festival Cities of the Pacific Coast" on April 2nd and 3rd, 1915, in the Exposition Grounds at San Francisco with parades and pageants of unexampled brilliance. It is hoped that, by means of such co-operation, many thousands of tourists will be given special facilities for seeing not only the Exposition but also the whole of the magnificent territory, rich in nature's wonders, that fronts the Pacific Ocean, from Prince Rupert to San Diego. Many of these travellers to the Exposition will take the Canadian route either going to or returning from San Francisco. Splendid steamships will carry passengers between Puget Sound and Prince Rupert, the gateway to Alaska, the terminus of the newest Trans-Continental Railway. Through the newly opened up wonderland of the Canadian Rockies, they will pass on to the Prairie section of the Grand Trunk Pacific and can return by a variety of routes to their homes in the middle West, the Eastern States and Europe, making a tour through one of the most fascinating regions in the world.

* * *

According to the report of the New Zealand Minister of Railways for the year ended March 31, 1913, 2,860 miles of line were opened for traffic, as against 2,808 for the previous year, the total earnings for the two years being £3,971,002 and £3,676,509 respectively. The



BOX CAR: NATIONAL RAILWAYS OF MEXICO.

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net profit on working in 1912–13, £1,265,393, is equal to a return of 4·04 per cent on the capital invested in lines open for traffic, which has increased from £30,506,089 last year to £31,611,220. The number of train miles run was 9,016,224, an increase of 644,537. The number of passengers carried, 13,213,879, showed an increase of 1,232,745 over the previous year; and the goods traffic, 5,957,005 tons, was higher by 357,249 tons. The live-stock tonnage, 289,123 tons, increased of by only 971 tons. The rolling stock was made up of 513 locomotives, 1,282 passenger carriages, and 19,515 wagons and brake-vans, increases of 20, 60, and 994 respectively. The average number of men employed rose from 13,523 in the previous year to 14,213.

* * *

A REMARKABLE effort in design has succeeded in standardizing for the Swiss railway service on the Simplon Tunnel route a type of locomotive carrying two motors of 1,250 h.p. each. The line voltage is 15,000 single phase, 15 cycles. There are five driving axles, and with two pony trucks the vehicle has 14 wheels altogether but sufficient play is allowed for negotiating fairly sharp curves. Some description of the performances of the 13 locomotives that are being put in service will be awaited with interest, but, as an engineering correspondent to *The Times* remarks, it is regrettable that though England took the lead in steam railway working every important recent development in electrical traction seems to be credited to other countries. One effect will be to place our manufacturers and contractors at some disadvantage in the future.

* * *

HOBBLE skirts and high heels continue to be responsible for an increasingly large number of injuries sustained by women while getting on and off trains, and mounting and descending stairways in stations on the Pennsylvania Railroad. A careful record kept for the three months ending October 14th of all injuries sustained by women due to slipping, stumbling or falling while on the railroad property, indicates that these accidents are becoming more rather than less frequent, despite the fact that the railroad has repeatedly called the attention of its women patrons to the number of accidents caused by hobble skirts and high heels. Between July 14th and August 14th, 44 such accidents occurred on the Pennsylvania Railroad. The records show 42 in the next month, and 52 during the month ending October 14th last.

* * *

THE Canadian Pacific Railway owns or controls 18,000 miles of railway. Its own system is comprised of 13.280 miles, and the Minneapolis and Duluth roads account for some 4,000 miles of track. It has still about 700 miles of spur lines and extensions to build in the west; and double-tracking will affect over 4,000 miles of railway. This as it goes on, will deplete the treasury more or less; but from this great undertaking large things are expected. The double-tracking of the system will give such reliefs as none but a railway man could fully understand. The difference in the mere physical operation of the trains will be enormous; but the chief consideration is to be in readiness for the vast increase in business which will disclose itself almost immediately.

IN Australia the first trial of the use of the track-layer in the construction of the east to west Trans-Continental has given satisfaction. The work was carried out by 42 men. Half of them worked with the train and half behind it. Half a mile of track was laid in 3½ hours, and in another hour the follow-on spikers had fixed the rails to the sleepers. The work done by 40 men was creditable. So soon as the half-mile was laid the men ceased work, in consequence of lack of rolling stock and locomotives. The half-mile laid, however, shows what the track-layer could accomplish if it were fed with material. To enable the machine to work to its capacity, supplies must be continuous, and siding accommodation will be required every ten miles.

* * *

A RAILWAY MAGAZINE foreign correspondent writes that the Baden State Railway has opened a large station in Karlsruhe, making seven new stations added within the last three years. On the Alsace-Lorraine Railways third and fourth tracks are being laid between Basle and Strasburg on the direct line from St. Ludwig to Strasburg along the Rhine. In St. Ludwig (near Basle) a large depôt is under construction. The Swiss Federal Railway are laying their main line from Basle to Olten deeper, and a new and longer tunnel is being made in order to save time and coal. It starts at Sissach, and extends for ten miles, but the improvements involve an expenditure of about £1,000,000.

* * *

AN important traffic agreement has been completed between the Canadian Pacific Railway and the Michigan Central Railway, under which a new fast express will be run daily both ways between Montreal and Chicago, greatly reducing the time between these cities. The old arrangement between the Canadian Pacific and the Wabash Railway will still remain, this arrangement being supplementary. The East-bound express in the new service will be a limited train named "The Canadian," while the West-bound one will be named "The American." The train times are arranged so as to connect with the fast Atlantic liners on the St. Lawrence route to England.

* * *

THE Canadian Pacific has just installed at the Windsor Station, in Montreal, an elaborate electrical inter-locking switch system. The housing of the machinery is at the end of Mountain Street just outside the enclosed yards. There are 88 levers and the signalman is assisted by an illuminated diagram which shows the whole of the trackage—eleven lines in all—with the positions of the several trains on each.

* * *

A READER resident in Calgary, Alberta, Canada, writes in reference to the collection of railway tickets, and would like to get in touch with other readers who are similarly interested. Unfortunately he omitted to sign his letter, and if he will communicate further we will endeavour to assist him.

* * *

ON the Tasmanian Railways a new regulation provides that no female person shall enter any room, carriage, or any vehicle set apart for smoking, and that anyone who does this after being warned may be removed and fined up to £10.

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THE Paraguay Central Railway Company announce that the first international train left Buenos Aires for Asuncion on October 12 from Lacroze station. Paraguay Central coaches were sent from Asuncion for the purpose, also Argentine North Eastern and Entre Rios vehicles. The service was officially inaugurated on October 17.

* * *

MR. J. LAWRENCE, a South African reader resident in Bloemfontein, writes in reference to paragarphs already published on the subject of "Straight Railways," that on the Bulawayo-Victoria Falls line there is a stretch of 75 miles, perfectly straight, extending from a short distance north of Gwaai Siding to a point just beyond Dett.

* * *

WE have received from the Queensland Government Railways an interesting brochure reviewing the history of the Queensland Railways for 1864 to 1914. The story is well told, and the numerous illustrations, portraits and other data included, render this booklet not only a useful one for reference, but also worthy of careful perusal on its own account.

* * *

THE Great Indian Peninsula Railway has entered the field of artistic poster publicity with an effective view showing a tiger at the edge of a rocky headland, a train lending life to the landscape. The intimation is "India, the Land of Sunshine, Sport and Travel—Spanned by the G.I.P., India's Imperial Mail Route."

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A SERIOUS fire occurred recently at the rolling stock works of Messrs. Hurst, Nelson, and Co., Ltd., at Motherwell. Several departments were threatened, but at last the fire was confined to the carriage building plant. Valuable machinery in the building, much of which was quite recently installed, and all the finished work, including eight railway coaches, which were to have been handed over the same week to the Glasgow and South Western Railway, were completely destroyed, as was also a first-class saloon for the Uruguayan Railways and 25 tramway cars.

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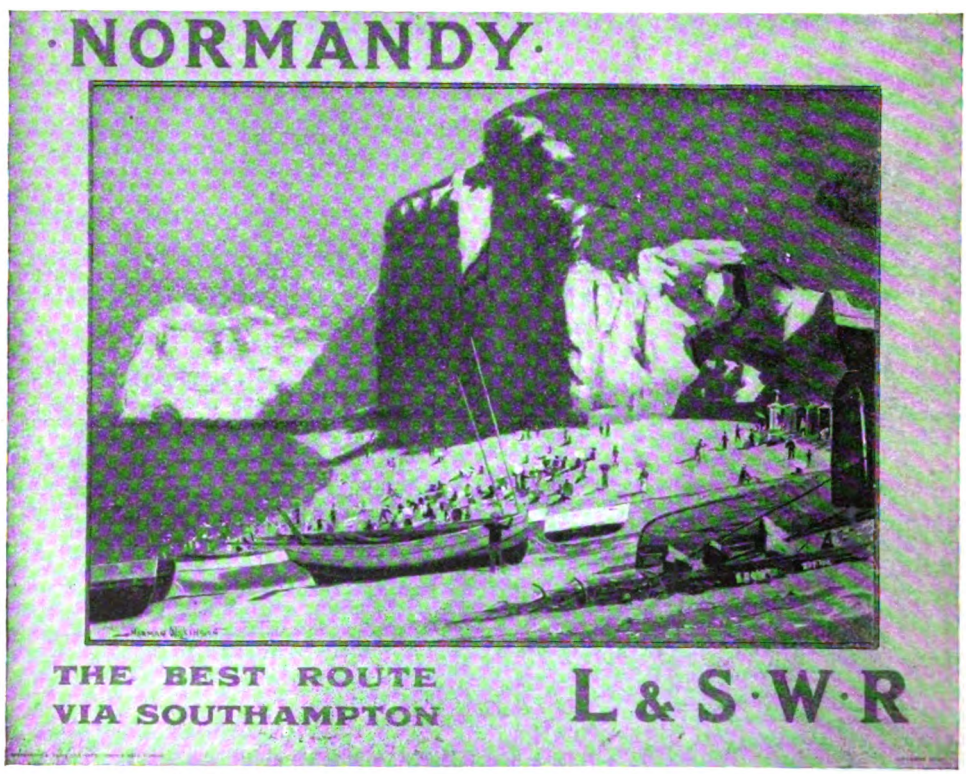
A NEW edition of the Westinghouse Brake Co.'s booklet on the Westinghouse-Morse silent rocker-joint chain drives, has been issued. In introduction a good account is given of the design and advantages of this method of transmitting power; and a series of views showing various applications affords illuminating testimony to its usefulness and the favour with which these chains are being received in all fields of industrial activity.



ANOTHER EXCELLENT CONTINENTAL POSTER ISSUED BY THE LONDON AND SOUTH WESTERN RAILWAY.

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